JOURNAL OF GAS LIGHTING & WATER SUPPLY.

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EDITORIAL NOTES.

Reception at the National Gas Exhibition.

THE event of last week in connection with the National Gas Exhibition was Patrons' Day on Thursday, when the President of the Exhibition (Sir Corbet Woodall, D.Sc.) and Lady Woodall held a reception, which was arranged for the express purpose of meeting as many of the patrons as could make it convenient to attend, together with a number of representatives of supporters of the exhibition. The success of the occasion will be one of the outstanding special features of the exhibition. Everything passed off splendidly; and visitors of social distinction, and eminence in scientific and professional life, were among the guests. The exhibition has been growing day by day in popularity, as is marked by the registrations of the turnstiles. As mentioned in our "Notes from the Exhibition," this last week has seen no less than 50 to 75 per cent. increases in the attendances, in comparison with the corresponding days of the preceding week. This is as things should be. Numbers, of course, count; interest counts more. The more the interested numbers the better. Observation and inquiries in various quarters show that, in all parts of the exhibition, especially in those concerned with domestic and industrial life, there is in the afternoons and evenings an unbroken display of public interest—an interest shared by all classes that go to constitute the community.

Naturally the most difficult people to reach, and to get to an exhibition which is intended to be educative and demonstrative rather than recreative, are those who move in the higher circles; and it was through the reception that a goodly number of these were attracted to the exhibition, there to see the advances in the application of gas that have been effected in recent years. The homes of those who move in the higher circles are centres of social life, and experiences there are influential. They may in the lordly mansions of Belgravia, and in the country residences of county folk, professional men, and commercial and industrial magnates, largely use electricity for lighting; but, for the large rooms of their dwellings, they cannot do better, for health, cleanliness, and efficiency, than adopt (as Dr. Leonard Hill was advising at the conference on hygiene at the exhibition last week) the radiant heat of the gas-fire, which is the most healthful and efficient of all forms of heating. They, too, above all people, like domestic conveniences; and they can afford to pay for the maximum of convenience on offer. There is nothing more convenient for them than the large range of culinary apparatus that is tendered them by the gas industry—a range unmatched by the kitchen applications of any other form of heating. There is nothing more convenient for them than the apparatus, heated by gas or coke, which will give a supply of hot water at every point in their houses where it is required—in bath rooms, in lavatories, on landings, in conservatories, and to hot-water radiators (or rather convectors), for supplementing the heating of the house in halls, corridors, and on stairways. The visitors invited to the reception were brought into contact with these things, in several forms, at the exhibition last Thursday. It is the object of the exhibition to demonstrate gas advance to all sections of the community. The seed is being sown there; and the ultimate good of it all cannot be predicted or measured.

Why not Trade on Quality?

INVALUABLE will be the conferences that have been held at the exhibition, if the gas industry will only take full advantage of the proceedings. The value lies not so much in the material that has been presented, as in the confirmation that it gives to the ascertained facts which form the basis of the gas industry's faith in the virtues of its prime commodity—confirmation that has come from men of high standing and credit in the world of science. Professor Lewes, Dr. Rideal, workers at the Leeds University, and many others have put the gas industry on the right track as to some of the matters that make for good reputation in regard to the use of gas. Dr. Stockhausen and Dr. Louis Bell and others have determined the relative intrinsic brilliancy of different illuminants, and their findings place gas lighting on a plane superior in this respect to its chief competitor; while Dr. Ives and Mr. Thorne Baker have given their authority for saying that the spectrum composition of gaslight is nearer than that of electric light to that of sunlight. The value of these two facts alone is vast if the gas industry would only put them into proper circulation among the people. The conferences have (as the reports that appear in this and previous issues of the "JOURNAL" show) brought other scientific men into closer touch with the gas industry; and it is clearly to be seen from it all that appreciation and confirmation of the strength of the gas industry's position are growing.

We get Professor Silvanus Thompson warning against the use of unshielded lights of high brightness in relation to their illuminating power; and we have Dr. Meredith Young affirming that gaslight is of less intrinsic brilliancy than electric light—a point that is too palpable to brook contradiction. We get no less an authority on the hygienic conditions of our atmosphere than Dr. Leonard Hill telling us that the most healthful form of warming is by radiant heat, and that the "radiant heat from a modern gas-fire resembles, "as nearly as possible, the natural conditions of sunshine "out-of-doors." And he condemns for health's sake any closing of the chimney, which has been recommended in order to conserve such heat as is obtained from the electric convector, which is a more suitable name than "radiator." All the authoritative tests that have been produced in connection with the modern gas-fire assure us of a radiant heat efficiency of from about 50 to (in the latest productions) 70 per cent. This confirmation is all from men of unassailable position, who started disinterestedly in their investigations, and issued from them interested in the methods of lighting and heating that show the highest hygienic efficiency. The knowledge of these things will become diffused; they will not stay where they are, nor remain confined to the conference room of the National Gas Exhibition. Not only are men concerned with the scientific and medical aspects of these things being persuaded by investigation and experience, but architects are being brought into line. When we have the President of the Society of Architects telling us he has adopted gas-fires throughout his house, it is evident that the members of the architectural profession are not oblivious to what is passing around them.

It is therefore seen that the gas industry has not adopted hypotheses or mere generalizations in regard to this matter of quality, but is proceeding on the safe ground of ascertained facts, which no amount of bluster or unsupported contradiction by competitors will or can disestablish. It is a strange thing that the gas industry, having on its side the advantage of quality of illumination and heating, does not make greater use of the fact in competition. In all other commercial work, quality tells; and of quality in obtaining good prices, the utmost is made. But what happens is that many gas undertakings sell at low prices, and give a superior quality of light and heat, and yet do not make any effective point of the latter fact. That is commercial stupidity; and there is no reason in it. The gas industry has been too prone always to adopt the defensive attitude. But, as Mr. Jacques Abady pertinently put it at one of the sittings of the conference, it is time the industry took the attacking side, and traded on the superior quality of both its light and its heat. The fact is that the gas industry has been much too modest.

In the Cause of Coke Sales Development.

THE National Gas Exhibition is in full swing; and everywhere a member of the public turns in the galleries at Shepherd's Bush, he finds lighting by gas, room-heating by gas, cooking by gas, water-heating by gas, iron-heating by gas, metallurgical and other industrial work by gas, and engine driving by gas. It is all one vast demonstration by gas. The British Commercial Gas Association are at the same time in full hue-and-cry after householders and tenants of other premises, to get them to adopt gas for all or some of the applicable purposes. There is in this connection a point that must not escape notice; and it is that increased gas consumption must mean (more particularly in these days of high oil prices, and low carburetted water-gas production) an enlarged output of coke. Therefore something serious must be done to cause the demand for it to keep pace with production. At the National Gas Exhibition, there are a few examples of coke-heated water-boilers; but we do not remember having seen there any of them actually at work. This being so, they are, amid the brilliance and heat of gas demonstration, somewhat in a nebulous background. Again, we do not recollect seeing the British Commercial Gas Association making any pronounced point of coke-heating in their advertisements. The first real public demonstration of coke-heated water apparatus, completely fitted up to illustrate its application to household (including bath-room) purposes, and conservatory heating, is the one on the South Metropolitan Gas Company's stand at the Ideal Home Exhibition, and we could well do with more of such demonstration. Speaking of publicity, some of the best advertisers of coke for heating are electrical engineers—at any rate, those conscientious ones who like their consumers to have the convenience of an economical hot-water supply, and plenty of it, at short notice. These engineers are in the habit of recommending coke water-boilers, and not the stage-coach method of obtaining hot water by electrical means. The electric lighting field really forms a good one for both gas and coke heating; but the electrical engineer has a friendly eye on coke, while he will do his utmost to keep gas service-pipes outside the houses of his customers. Surrounding the gas service-pipe is the very proper fear of a reduced account for electricity.

The general neglect of coke in propaganda work must now cease, or the neglect will recoil on the gas industry in the shape of ever-accumulating coke stocks, and much lower prices. Some units of the gas industry are strange in certain of their doings. If contribution to propaganda work is made in one direction, there is hesitation on their part to make contribution in another direction. The administrators do not look upon their undertaking as being in business in more than one commodity. They fail to realize that they are running (say) four distinct businesses—as gas merchants, as coke merchants, as tar merchants, and as sulphate of ammonia merchants. The narrow view is probably due to gas being the primary product, and "gas" appearing in the title of the concern. Money may be spent on developing the gas business; the other businesses have largely to take care of themselves. This ought not to be. Each business should be guarded and energized by ordinary commercial methods. As to what should be done, we have an exemplar in the systematic and persistent work of the Sulphate of Ammonia Committee. It has been common knowledge in London gas circles for some time past that a Coke Committee has been formed for London and the suburbs, for the express purpose of developing the use of coke in the home and in industry. We have been looking for the symptoms of activity on the part of the Committee; but it seems that they have been working quietly, in order to get their feet firmly planted. Whether or not it is due to the influence of this Committee, we are unaware, and it does not much matter, but the British Commercial Gas Association have come to the conclusion that their work can be usefully extended to embrace the encouragement of the use of coke as well as of gas. We hope that the Association are sincere in this matter, as it would be an infinite pity for the good effect of their gas work to be discounted by the supply of coke assuming unwieldy proportions in relation to the demand. The Association have, we learn, appointed a Sub-Committee on Coke; and this Sub-Committee and the London and Suburban Gas Companies' Coke Committee have come together for the purpose of assisting one another in the matter of coke propaganda. Another important move is that the Companies' Committee have engaged a coke expert to advise London steam users in regard to the use of coke under their boilers. A list of factories in London and the suburbs is being prepared for the expert's use; and he will make it his business to call and see the owners of factories, and show them what can be done by adopting coke as fuel. There is the domestic service too; and here the Coke Committee's motto is "Coke "for heating; gas for cooking." It is an excellent motto —for the Committee; but the householder and the factory owner will exercise their prerogative as to which they will adopt for heating.

We are glad to learn of the movement of the Committee. There is no question that the Coke Committee are face to face with a big work, in association with which they must expect to meet resistance. But the trend of things now is to abolish the crude use of coal, which use is the enemy of economy and health; and therefore now is the time to try to increase, by legitimate trading method, the place of coke in domestic and industrial service. What has so far been done indicates a seriousness on the part of the London and Suburban Gas Companies in taking up coke propaganda work; and we hope that the Committee will be adequately encouraged, so that they may do their popularizing work properly. The movement is likely to extend to other parts of the country; and, if the result is that local markets are more largely developed, there will be less coke competition from outside, reasonable prices will be maintained, the gas undertakings and the gas consumers will reap advantage, and so will the community generally through the more sanitary state of the atmosphere.

Unfair Dealing and a Writ.

IT was an important announcement that was made in last week's issue, that the Long Eaton Gas Company have issued a writ against the District Council in respect of unfair trading in connection with their electricity supply concern. It has been common knowledge for some time past that the relations of the Company with the District Council have, in regard to this matter, been of a strained character; and now they have reached the breaking-point. The present step, we know, has not been taken by the Gas Company without most deliberate consideration, fortified by the opinion of high legal authority. We are not—a writ having been served—at liberty to discuss the rights or wrongs of either party to the proceedings; but it is quite obvious that, to establish their case, the Gas Company would have to show that the Council were acting *ultra vires*. There is some local talk of compromise; but, though it would be a heavy burden on the Company, we feel inclined to hope that the case will come before the Courts. There is a matter of principle involved here; and judicial determination is necessary as to the real intentions of Parliament in regard to the length that trading in electricity supply by municipal authorities should go—whether Parliament intended municipal trading to be conducted by any brutal means which would throttle and make impossible private enterprise. The case, if it proceeds, would be, in effect, a test one; and success on the part of the Long Eaton Company would, no doubt, govern action on the part of many other gas-supplying authorities in the kingdom.

Speaking generally, and not with particular reference to Long Eaton, private gas enterprise suffers severely from the methods of trading in electricity by municipal bodies—through unreasonable charges to cut out gas companies, and owing to the multiplicity of positions occupied by individual members of local authorities, which give them an undue influence in favour of the municipal electricity concern. The position is quite different from that which obtains where the competing gas supply and electricity supplies are both in the hands of private companies. Many instances of unfair municipal dealing have, we believe, been collected, showing the kind of loose trading that is going on in different municipal supply areas, which places statutorily controlled gas supply at a disadvantage. Let us quote as an example just one instance—not from Long Eaton. A large business establishment was (we believe it would be right to say "is") using electric motors, for which it was being charged for energy 1d. per unit. More light was required. The local gas company (one working under statutory regulations in regard to price) tendered for high-pressure lighting; and a contract was about to be entered into for it. The municipal electricity supply department hearing of this went to the proprietors of the establishment in question, and offered them energy for lighting at the power price. The offer was

accepted. Was this fair competition? Was this municipal electricity undertaking acting within its parliamentary rights? Whatever may be the answer to the second question, there can be no doubt as to the answer to the first one, seeing that the same municipal authority are charging the ratepayers a higher price per unit for street lighting, and for general municipal purposes, and other large consumers—and larger consumers—for lighting a still higher price. The establishment in question is therefore getting current for lighting on preferential terms—a condition of things not contemplated by Parliament—and on terms below those previously offered for the same purpose. And this lighting current at power price for no other reason than to enable the municipally run electricity department to cut out a gas company authorized and regulated by Parliament, and a gas company who are exceedingly large ratepayers. It is impossible for private enterprise to conduct a legitimate business in such circumstances as these. We cannot think that it was ever intended by Parliament that municipalities trading in electricity should have loose and arbitrary powers for use as they willed in violently strangling private enterprise. At least Parliament ought to see that municipal trading is conducted on terms of equality with private enterprise. If it cannot be, then municipal trading ought never to have been permitted.

The position is a serious one. In the case of gas undertakings, Parliament fixes maximum and standard prices; and it even states what shall be the difference in price between outer and inner areas. Many gas undertakings are allowed from the ordinary price to grant discounts of 10 per cent. for prompt payment, and 15 per cent. for large consumptions, and the local authority gets privileged terms for gas supply for public purposes. In the case of these concerns, there can be no departure for any purpose beyond the limits of discounts allowed from the current flat-price. In the more modern legislation, there has been a departure from fixed discount limits to open discounts, but with the proviso that "every such contract entered into by the company shall be "alike in terms and amount under like circumstances to all "consumers." This shows that gas companies cannot play about in any erratic manner with the charges that they may make. The enactments clearly show that Parliament desires to protect private consumers against any undue preferential treatment of other consumers, always excepting the local authorities. What Parliament has ordained in the case of gas supply, it surely intends in the case of electricity supply—whether the supply be given by a municipal authority or by private enterprise. There are maximum prices placed upon electricity supply; and nowhere do we find in the legislation applying to electricity supply that Parliament ever contemplated the extraordinary preferential treatment of consumers that now obtains especially in the case of municipal electricity trading.

The wonderfully devised and varied electricity tariffs of to-day make it impossible for a layman to say whether or not the charges are within the terms authorized by Parliament. There is the Norwich system for example, with a fixed sum based on rateable value, and a charge of 1d. or ½d. per unit in addition. It is quite easy for small lighting consumers on this system to be paying per unit a sum altogether in excess of the maximum Parliament has allowed. Only the other day an electrical engineer in one of our electrical contemporaries admitted that ordinary consumers in his district are paying under his tariffs prices ranging from 0·7d. to 1s. per unit. Is this sort of thing in conformity with the principles of Parliament, or the sort of thing that Parliament contemplated when essaying to protect consumers from undue preference being shown through the public service to any class of consumer? We think not. A man travelling once a day in a municipal electric tramcar and paying his penny has the same service rendered him at no more cost than the man who does the same journey half-a-dozen times a day, and pays a penny each time. There is no undue preference there; but the same thing does not obtain in the municipal electricity business, in which units are supplied at most erratic prices—in fact, at any price the electricity undertaking can get. A man may have an electric radiator, and merely use it occasionally on his arrival home in the evening during the winter, and during lighting hours, and pay only 1d. per unit for the energy used; while a lighting consumer using current every day of the year, and for more hours per day, may have to pay as much as 5d. per unit.

There are no rational bases—no bases having sensible relation the one to the other—for certain of the charges at present made by many electricity concerns. The result is that there are numerous municipal electricity undertakings that have had to fall back upon the general rates for succour, and many have still to do so in these days, with the result that ratepayers entirely innocent of having had any part or lot in bringing into existence municipal trading in electricity supply, and ratepayers who do not want electricity, have to suffer the burden of increased rates. Some electricity undertakings, too, that have earned a net profit in the past, but have not put by any reserve for a rainy day, have shown lately to what a narrow margin they have been working, by the increase in the price of coal throwing them back into the profitless state. It was a sound decision of Judge Low Smith at the Limerick Quarter Sessions in June last year that quashed the electric-lighting rate levied to meet a loss of £1576, which came upon losses in prior years aggregating nearly £16,000—and all this with the department selling electricity at much below maximum price, and no reserve fund in existence. It is time that there was a thorough inquiry into these matters. It is time that some legal interpretation was given to the powers of charge conferred upon municipal electricity suppliers, so as to ascertain whether or not it was ever contemplated by Parliament to confer upon local government the right to plunder private enterprise by the aid of unfair preferential charges.

Among the Scottish Juniors.

THE last two issues of the "JOURNAL" have borne witness to an excellent start having been made with the winter session by both divisions—the Western and Eastern—of the Scottish Junior Association; and we should be wanting in duty if there was neglect to compliment editorially the members on the character of the technical material presented at both opening meetings. The President of the Western Division is Mr. John Wilson, of Falkirk; and he modestly preferred that his address should be called a "paper." It matters little by what name contributions to the proceedings of the junior or any other organizations are called, so long as they contain information valuable either for its direct or for its indirect lessons. The so-called paper by Mr. Wilson will be valuable for both reasons; for it supplies an account of how an ugly piece of subsidence work under a retort-house at Falkirk has been dealt with, and incidentally it also acts as a warning to those who are preparing to take up the responsible charge of gas undertakings, and who may hereafter be called upon to design new or extension works. Where such heavy plant as a modern retort-bench is going to be constructed, no engineer would be worthy of the name who went about the work without first of all taking the precaution to test the character of the foundations, and then determine what (if any) special steps were necessary in order to protect the work which he proposed to place upon the site. When an engineer does take borings and finds conditions that may prove fatal to stability if not adequately dealt with, then it is difficult—in fact, impossible—to fathom his reasons for not assuring himself against possible disaster. If he does not so assure himself, he may be laying the foundations for a tremendous amount of worry, difficulty, and waste for himself or someone else to encounter later on.

Here in Mr. Wilson's paper, we have described a retort-bench which commenced to show signs of subsidence, and the creeping continued; and then finality in sinking seemed to have been reached. But afterwards the sinking was resumed, and uncomfortable circumstances were produced in the bench, and in the manufacturing returns. Then the trouble had to be dealt with, in a difficult manner, and at a cost that could have been avoided if only the construction had originally been executed as it should have been. There is one thing that the paper itself does not make quite clear to those who are not so intimate with Falkirk as are our Scottish friends; and it is that Mr. W. Wilson, the present Engineer, was not the responsible Engineer in 1904, when the construction of the retort-bench was first taken in hand. Mr. Alexander Wilson, in the discussion on the paper, to an extent intimated this, but not so clearly as we can do here. It is quite sufficient to bear the burden of our own failures without going about with people mistakenly conferring upon us the discredit for the failures of others. The cause of the subsidence was a bed of moss under the bench; but only some 9 feet below the floor-level of the house was a bed of boulder clay, from which support, in view of the presence of the bed of moss, should have been obtained. But the singular thing is that this was not done—singular seeing that borings were made before the bench was constructed, and, as a matter

of fact, the foundations of the chimney stack were carried down to the boulder clay. The presence of the bed of moss was therefore well within the cognizance of the Engineer of the day. But it has been left for others to suffer for the omission of 1904, and to rectify it after much damage, trouble, and loss had been encountered. Mr. Wilson—the Presidential Mr. Wilson—gave a very admirable account of how the ticklish "job" was attacked, and economically accomplished, in rendering further subsidence impossible (see *ante*, p. 55). The information is of interest; but it is hoped that it will not be required except in circumstances in which conditions may have arisen which were not divulged by precautionary borings on work when originally taken in hand. Such cases are known. But in this one there really seems to have been no excuse for taking such a heavy risk when the bed of moss was within knowledge.

It was regrettable that Mr. W. Geddes, of Edinburgh, was, through illness, prevented from being at the first meeting of the session of the Eastern Division of the Association; for the address (see *ante*, p. 159) that he had prepared was a composition of exemplary character. There was review in it, and considered opinions on matters that bear upon our industrial economics. Quite deserved were the good things said about it at the meeting. Most of the subjects mentioned in the address have been dealt with before; but Mr. Geddes treats and illustrates them in his own particular way, which is a convincing one. The leaning of the address is towards the works and their affairs; thus disclosing the direction in which the interests of the President more especially lie. The two matters to which he gives greatest attention, and in which he shows much analytical capacity for discovering the influences of specific conditions, are in connection with the relation of the capital account and the price of gas, and the bearing upon financial results of coal purchases. If the address does not appeal in parts to the larger gas-works of Scotland, we rather fancy it will do so to managers of some of the smaller ones; and probably there are not a few of the managers of the larger ones who, with certain tabulated figures before them as to the cost of capital per 1000 cubic feet of gas sold, and the net cost of gas into the holder, will be set inquiring into their own accounts, and, possibly, into the reasons for this condition of affairs.

Emphasized so often in these columns as to have become trite, is the assertion that nothing stands more in the way of cheaper gas than a heavy capital account per unit of gas sold; and the figures before us from Scotland add weight to the submission. The care of one's capital account, consistent with business done and economical working, is a matter that has frequently been urged; and though in most cases heavy capital accounts are a burden transmitted from the past, it is a truly remarkable thing that so many gas undertakings are not doing more than they are at the present time in taking advantage of legitimate courses to bring down the average capital charge, not only through increases of business, but by depreciating nearer to permissible limits. There was something said on this matter in a highly suggestive paper read at the last meeting of the North British Association; and the more the subject is looked into, the more pronounced is the pity that opportunity for dealing with it is allowed to glide away. Future stability makes imperative claims upon the present; for no matter how healthy the gas industry's current affairs may appear, it is as certain as anything can be that the lines of future development and cheap gas are inseparably bound up together. In the eight undertakings given as examples by Mr. Geddes, we have the wide variation in the capital charges per 1000 cubic feet of gas sold that is represented by 4·69d. and 12·84d. We know which figure we would rather have on our side in the future. But wide divergence does not really end with the capital account. The net cost of gas in the holder per 1000 cubic feet sold in the case of the eight concerns varies from 4·81d. to 10·88d.; and a couple of them with high net prices are among the worst in regard to the weight of the capital charge. Of course, not knowing which undertakings are referred to (we might discover them by prolonged research), we cannot say whether or not the higher costs in the holder are justified, or whether there is any room for economy. But the figures certainly suggest that there are undertakings in Scotland (we do not think Mr. Geddes has included any of the small ones in his tables) in which there is scope for the application of some exertion in causing certain of the quoted figures to recede.

On the subject of coal purchases and residual production, the importance of a test plant, and of contracting for coal on the results of testings only, with periodical testing so as to see that quality is maintained, is insisted upon in the address; and, by calculation, Mr. Geddes demonstrates how it may well be that the cheapest coal is the dearest in the long run for a gas undertaking. This leads to another point which has been previously made in these columns, that the purchase of certain classes of coals with a view to showing high makes may also be to the financial detriment of gas undertakings. No hard-and-fast rule can be laid down in this matter; but unless a manager is capable of looking at all sides of this coal purchase question, and approximately ascertaining the net return per ton of coal, he may be the cause of considerable loss to his undertaking. Among cognate points, Mr. Geddes believes that if more attention were paid to the purchase of coal giving a low percentage of ash in the coke, a larger coke business could be done among the residents in a gas-supply area. He also advises gas undertakings with an output of 10 million cubic feet of gas per annum to adopt sulphate of ammonia manufacture. Some works with a lower make than 10 millions have done so (using the direct system) with advantage. The address is really an excellent one; and we are pleased to make the acknowledgment.

THE CROWD IN THE EXHIBITION LAST SATURDAY EVENING.

[What is seen in this view of one hall is what was found in all the galleries on Saturday evening. It was a remarkable sight; and everywhere it was necessary to move with the stream of people.]

THE BRITISH COMMERCIAL GAS ASSOCIATION.

SECOND ANNUAL CONFERENCE—LONDON, OCTOBER 21 and 22, 1913.

PRESIDENTIAL ADDRESS DELIVERED

By EDWARD ALLEN, M.Inst.C.E., of Liverpool.

It is a matter of hearty congratulation that this the second conference of our Association is being held in the capital city of the British Empire and the commercial centre of the civilized world. There were special reasons for selecting Manchester last year as the place of the first meeting; and the results of the conference in that city fully justified the choice. To-day we are recognized as a National Institution; and we are grateful to the Lord Mayor and the Corporation of London for the privilege of meeting in this historic place, and extending to us the favour that has been granted to those other great Associations that have done so much to consolidate and extend the industries and commerce of our country.

It would be difficult to exaggerate the importance of the manufacture and distribution of gas. It is in its extent a great industry, employing capital to the amount of about £140,000,000 and paying an annual wages bill of nearly £8,000,000. These impressive figures are further enlarged by those of the allied industries, engaged in supplying the plant and materials required in its operations. It should further be noted that in all the industrial operations of the country, gas is largely used. In mills, factories, and workshops it is the general lighting agent, and a very large amount of gas is used by gas-engines, which provide power, and by appliances for various purposes. Quite recently there has been a rapid development of the use of gas as fuel in metallurgical processes, and the gas-furnaces of Birmingham and Sheffield now play a very prominent part in their important industries. Special attention is being paid by the Association to this, the industrial, side of our business; and a series of booklets is being published on "A Thousand-and-One Uses of Gas," the immediate results of which are very satisfactory. We shall be hearing much of value on this subject from Mr. Thornton during the conference.

It is, however, in the homes of the people that the value of gas is most highly appreciated. By its use, dwellings are lighted cheaply and efficiently; the important operations of cooking are carried out with comfort and certainty; the gas water-heater has now joined forces with the gas-cooker, as we shall hear from Mr. Broadberry; and, by means of gas-fires, the exigencies of our variable climate are successfully dealt with. Thus, so far as material things are concerned, comfort and happiness are assured. It is true that other agencies exist for the purpose of dealing with the problems of the home; but while these may be appreciated in the absence of gas, they fail to provide anything like so satisfactory a solution. Other problems of social life are mitigated, if not fully dealt with, by the operations of our industry—such as the smoke nuisance and the domestic servant question—upon which Mrs. Brereton will be speaking to us presently; and we do not hesitate to say that life in this great city and other large centres of population is made pleasanter, and the burdens that are necessarily connected with city life made lighter, by the extended use of gas in the dwellings of the people. We feel, therefore, that the greatness and importance of our industry furnish together a sound claim to the consideration which our Association has received at the hands of the Right Honourable the Lord Mayor and the City Corporation, by whose favour we meet to-day in this historic and world-famous building.

This Association has for its ideal the demonstration to the public that a great commercial enterprise can be conducted in the interests of public health, public comfort, and public economy, and at the same time on sound financial lines. Its policy is not aggressive—although it can strike hard when the industry is unfairly attacked. Its organizers believe that there is a comfortable place in the sun for others as well as themselves. All they are concerned in is the development—by every legitimate means—of a great public utility, knowing that good service brings its fair reward, and believing that side by side with that development advance the health, happiness, and prosperity of a country that still suffers far too much from the blight of smoke and fog.

This conference is not held in London because of any special need of enlightenment on the part of those conducting the affairs of the gas industry in the Metropolis. On the contrary, it is gladly recognized that in the work of publicity, the great London gas undertakings have played a leading part; and that the whole country has benefited by their example. The advertisements in the London newspapers and magazines have proclaimed the advantages of gas in every corner of the land, and have been the means of orders being sent to the local gas-works for gas appliances that otherwise would not have been thought about. The demonstrations in street and shop lighting by high-pressure gas given by the London Companies have benefited Provincial undertakings. These benefits are gratefully acknowledged throughout the land; and the representatives from the Provinces at this conference desire, by their presence, to do honour to the London Gas Companies and their staffs of skilful and zealous officials, whose operations command universal admiration.

A retrospect of the past twelve months affords much satisfaction. At the end of each quarter there has been a substantial increase in membership; and as to-day there is 77 per cent. of the capital employed in gas undertakings represented in the Association, it may be said the industry is rapidly becoming united in this organization. The report for the year is in the hands of those present, and furnishes a very complete account of the present position of the Association and the operations that have been carried on during this period. The perusal of this statement evokes feelings of intense satisfaction, and we recognize in the work accomplished a sure foundation upon which to continue building a great structure.

It need hardly be stated that the beneficial influence of our organization has been felt by the gas undertakings throughout the country. In almost every report presented to shareholders or ratepayers it is stated that there has been a satisfactory increase of business, and a growing demand for gas appliances, and there can be no doubt whatever that this satisfactory state of affairs is due in no small measure to the work of the Association. As there is therefore a common advantage by the operations of the Association, it is strongly urged that there should be a common support given to the Association. Sir Corbet Woodall, under whose presidentship the remarkable successes of the year have been achieved, stated in his Presidential Address last year that the Association's labours may be divided into three sections—viz., publicity, sales organization, and service development.

In reference to the first—publicity—great things have been achieved under the management of the Executive Committee and their excellent experts. The artistic pictures in magazines and newspapers (aided by letterpress which is characterized by careful avoidance of exaggeration) tell their stories effectively; and an educated and enlightened Daily Press give valuable assistance in the dissemination of reliable information. There is no doubt that one of the most important results achieved by the conference at Manchester last year has been the increased attention given by the Press to our important industry. The Association is very greatly indebted to the Press for their assistance in spreading the truth concerning the use of gas for all purposes, and their numerous and widespread references have influenced men of the medical profession, architects, educationists, and other leaders of men to at least give careful consideration to the claims made as to the hygienic effect of gas lighting and the innocence of the gas-fire, with the result that old prejudices have been removed, and the public have received wise advice and counsel.

It is also noteworthy that Press notices concerning the work of the Association have influenced those in charge of gas undertakings throughout the country. In too many

cases little attention was being given to the claims of the consumer and to the extension of business that waited at their doors; and it is hoped that one result of this, as of the first, conference will be the enrolment of those undertakings that up to the present time have remained outside our ranks.

The experience of the past year has undoubtedly shown the value of co-operation in the work of publicity. The science of advertisement has been applied by skilful exponents to our common service, with gratifying results. It must be remembered, however, that if all the merit is in the advertisement and none in the article offered for sale, permanently good business will not be achieved. The successful salesman—as we shall no doubt hear from our friend Mr. Waddom—is the man with a good article, and who is able to demonstrate its merits to the prospective consumer. Neither artistic pictures nor clever literature will sell goods not suited to a customer's requirements. Fortunately, we offer an article that is pre-eminently suitable for, and is needed in, the home, the workshop, the factory, and wherever light, heat, or power is required.

In regard to the value of gas as a source of light, it is established that, in a high-pressure lamp, the light given per cubic foot of gas per hour is fully 60 candles, and the cost, with gas at 2s. 1d. per 1000 cubic feet (the present price at Liverpool), or 40 cubic feet for 1d., would be 2400 candles for 1d.—this is for gas only. This is the present maximum result, but not by any means the limit of possibility. In regard to the value of gas for heating purposes, it is incontrovertible that one cubic foot contains (say) 550 B.Th.U., and therefore at a cost of 1d. (the price being 2s. 1d. per 1000 cubic feet—again taking Liverpool) there can be obtained 22,000 B.Th.U.—a fact which places gas in the front rank as a source of heat and power.

In further reference to publicity, mention must be made of the great and unique exhibition now being held at Shepherd's Bush, in the conception of which our Association has played a leading part, and which, it may safely be said, could not have been organized apart from the Association. We are not yet in a position to speak of the exhibition as a whole, as there is an unexpired period of 10 days to run; but we are able to express the opinion that the National Gas Congress and Exhibition of 1913 marks the highest point yet reached in the history of our industry.

The industry has, however, benefited to a still greater extent by co-operation in "Sales Organization" and "Service Development." The monthly Bulletins of the Association are full of valuable information, and furnish a course of education to the salesmen throughout the country.

In regard to the third section referred to by the Past-President—service development—special thanks must be given to the members of the Society of British Gas Industries, by whose efforts great improvements are being effected in gas appliances for all purposes; and thus the service obtained from gas is being greatly developed. The co-operation of the makers of plant and appliances with the management of gas undertakings, made practicable in the British Commercial Gas Association, has been of incalculable value to the industry and the general public.

This address would not be complete without some reference to the subject of gas coke. By means of coal gas a convenient, inexpensive, and efficient source of light and heat is obtained; but for the latter purpose the industry also provides in gas coke a solid fuel which can take the place of coal for all practical purposes without polluting the atmosphere with smoke and other deleterious products.

No language can be too strong in denunciation of the practice of using raw coal for industrial or domestic purposes. It is said the Englishman loves to see a roaring coal-fire, and is unwilling to give up the privilege of using the poker to stir it up to a sense of its duty. But a little reflection will make it clear that his affection is not bestowed on the coal *per se*, but upon the red-hot coke, the formation of which is hastened by the poker. A black fire is his aversion; and the glowing embers that radiate the heat which is so gratifying to his person and so efficient in providing a good roast for his dinner—these glowing embers are the coke that has been so wastefully formed out of the black and smoky coal.

A single ton of coke contains the same heat units as a ton of coal—within 3 per cent.; and this slight deficiency is balanced by more even and regular heating.

Our Association has just formed a Coke Committee for the purpose of bringing the value of coke as a smokeless fuel before the notice of the public, and of inducing gas undertakings to put it on the market in the condition best suited to the requirements of their customers, and distributing it in the most convenient manner.

It may be remarked in passing that the substitution of gas coke for coal is one of the best means of checking the upward tendency of coal prices.

It is surely apparent to all right-thinking persons that the ideal system is for all the coal to be sent from the colliery to the gas-works, there to be scientifically utilized in the manufacture of gas, coke, and the other valuable residual products that would otherwise be not only wasted but cause a serious public nuisance.

In conclusion, we are to-day thankful to be able to look back with considerable satisfaction on the work accomplished, and to look forward with a feeling of supreme confidence to a great and glorious future.

REPORT BY THE GENERAL COMMITTEE.

The General Committee have pleasure in submitting their second report, which is the first which deals with a complete year of public work.

The progress made by the Association during the past year in winning the support of the undertakings of the country has been very gratifying.

At the end of September, 1912, the number of undertakings on the list of subscribers was 252. It is now 410; and although this is still only one-fourth of the total number of undertakings in the kingdom, statutory and non-statutory, the 410 subscribers represent 77 per cent. of the industry measured by output of gas.

Not only has the number of subscribing undertakings steadily increased, but many of those which at first only gave partial support have during the past year adopted the 2s. 6d. per million basis—notably, Dublin, Glasgow, and Oldham.

This steady measure of progress, which the Committee hope to see fully maintained, or improved upon, during the next year, is due they feel to the fact that those administrators of gas undertakings who were at first dubious as to the national utility of the Association, are gradually coming to realize that it is doing work from which every concern in the country (great or small) is deriving its share of benefit, and should therefore bear its share of the cost. The Committee have never believed, and it would take much to make them believe, that any Committee or Board of Directors would refuse to support the Association, once the members realized that their undertaking was benefiting by its operations.

The Manchester Conference—which owed so much of its success to the presidency of Sir Corbet Woodall, whom the members were delighted to congratulate upon the highly deserved honour since conferred upon him by His Majesty—did much to make known the work that was being done; the inquiries and orders that have resulted from that work have also afforded conclusive evidence in many quarters of the widespread interest aroused among the public; the comprehensive selection of all descriptions of literary and pictorial publications placed at the disposal of all undertakings in retail quantities at wholesale prices has caused many to realize the value of co-operative as opposed to individual production; while the means afforded by the Association of bringing home the truth in regard to the hygienic as well as utilitarian advantages of gas lighting and heating to those who have influence with the public in matters of health and sanitation, have proved to others that it is an organization worthy of universal support by the industry.

Much good missionary work has also been accomplished by District Associations and Institutions; and it is hoped to make fuller use of their organization in future in sustaining local interest in the work of the Association. Arrangements are also being made to hold interim meetings at local centres in the interest of the Association.

It is confidently hoped that the National Gas Exhibition (which is a triumph for the spirit of co-operation, and a concrete example of the work of the Association), together with the forthcoming conference of our members, will lead to further additions to the roll of subscribers, and to a substantial increase in the amount now contributed both by the undertakings and by the members of the Society of British Gas Industries.

The appeal for funds for the exhibition has undoubtedly had some effect this year in the direction of keeping-down

the amount subscribed to the Association by some undertakings and firms. But it is hoped that, having acquired the habit of expenditure through co-operative organization, many who have hitherto either not supported the Association at all, or have only done so in a partial manner, will in the near future become its convinced and generous adherents.

There is still great need of more money for the work that lies to our hands, as the Committee feel that they have only touched the fringe of the productive work that could be done. The Association is advertising in only 139 publications, and in many of those in but a trifling way. Whole page advertisements in all the leading papers and magazines at frequent intervals would bring an abundant harvest to the industry; but they cost a great deal of money. Lectures throughout the country on the broad aspects of the smoke abatement question, and on the hygienic side of gas heating and lighting—and research work to form the basis for such lectures—would be of great value to all; but these, too, cost a great deal of money. Special articles in all trade papers at frequent intervals would well repay their cost; but lack of funds prevents this being done on any comprehensive scale.

A satisfactory feature of the accounts is that the administrative expenses only represent 5 per cent. of the total outgoings. The office staff and accommodation is kept within very close limits; and every credit is due to the Secretary for the economy practised in his administrative work. The low rate of office expenditure is also made possible by the fact that the Editor provides elsewhere office accommodation, staff, and expenses for all this very active side of the Association's work.

The publications side of the work is, except in regard to the literature given away to the public in answer to inquiries, self-supporting, and bears its fair share of salaries and office expenses.

The sales of literature during the past year reached a total of 2,600,000 items (as against 700,000 in the period reviewed in the Committee's first report) and are constantly increasing. Special mention may be made of the comparatively new monthly publication, "A Thousand and One Uses for Gas," of which the monthly circulation has already exceeded 10,000 copies, and is likely steadily to increase as members realize its value for propaganda work in the industrial field.

The cost of the Bulletin is not heavy considering that the bulk of its circulation is free (to all members, associate members, and international members), and that there is no revenue from advertisements—without which any non-subsidized periodical would go straight to the Bankruptcy Court. The paid-for copies of the Bulletin now number 800 a month; and the Committee would be glad to see this subscription list materially increased. The matter in the Bulletin is of no little value to all engaged in salesmanship, and does not overlap the work of the technical journals.

The number of associate members has risen during the year from 83 to 112, and of international members from 6 to 39. The Committee hope to be able to make many more additions to both lists during the current year.

The members will be particularly glad to welcome among them at their conference a representative of the National Commercial Gas Association of America (Mr. Oscar H. Fogg), and to hear from him some account of the work of that very progressive organization.

The President has given notice of his intention to move at the annual meeting the following resolution, which has the full support of the Committee, and will, it is believed, commend itself to all the members:—

That Rule 3 paragraph (*a*) shall read:—

> "The President shall be elected by ballot from the list of Vice-Presidents by the members, and his term of office shall be from the close of the annual general meeting at which such election takes place until the close of the annual general meeting in the following year."

That paragraph (*b*) of the same rule shall read:—

> "The Vice-Presidents shall be elected from time to time by the General Committee from amongst eminent administrators connected with subscribing undertakings. The President for the time being of the Institution of Gas Engineers shall be *ex-officio* First Vice-President of the Association."

That Rule 7 paragraph (*c*) shall read:—

> "The first Vice-President and five Vice-Presidents" and so on.

That in Rule 10 paragraph (*a*) the words "fifteen" be substituted for "eleven," and that section 1 of the same rule shall read:—

> "The President and First Vice-President (*ex-officio*) and twelve members, to be elected by the General Committee from amongst the members of that Committee, but so that three of them shall be members of the Institution of Gas Engineers, and three shall be members of the Society of British Gas Industries."

The following additions have been made during the year to the list of Vice-Presidents and of the representatives of districts upon this Committee:

ADDITIONAL VICE-PRESIDENTS.

Alderman W. Armitage, J.P. (Doncaster).
Sir Joseph Bellamy, J.P. (Plymouth).
Alderman J. Craig, J.P. (Belfast).
H. Wade Deacon, J.P. (Liverpool).
Colonel G. Gascoyne, J.P. (Derby).
F. W. Goodenough (London).
George G. Gray, J.P., LL.D. (Hastings).
G. Hardy Harris (Exeter).
Dr. G. A. Jeffery, J.P. (Eastbourne).
Rt. Hon. Robert Kirk Inches (Lord Provost of Edinburgh).
Bailie John A. Lindsay (Edinburgh and Leith).
Alderman J. M'Gaul, J.P. (Birkenhead).
Reginald J. Neville Neville, J.P., M.P. (Brentford).
Bailie Thomas Paxton, J.P. (Glasgow).
Alderman W. Penrose-Green, J.P. (Leeds).
Alderman T. Smith, J.P. (Leicester).
Alderman David Wade, J.P. (Bradford).

ADDITIONAL DISTRICT REPRESENTATIVES.

Manchester.—Alderman H. Wilde, J.P. (Oldham).
Midland.—Hubert Pooley, A.M.I.C.E. (Leicester),
Scotland.—Councillor T. Irwin (Glasgow) in place of Bailie Kirkland (retired).
Bailie J. A. Lindsay (Edinburgh).
Southern.—W. J. Sandeman (Croydon).
South-Western.—Robert Beynon (Torquay).
Society of British Gas Industries.—Alderman F. Templer Depree, J.P.

The increase in subscriptions now entitles the Midland and Southern districts to elect one additional member to the Committee; and arrangements will be made for such election at the forthcoming meetings.

The Committee submit this report in the hope that it will give both satisfaction and encouragement to their supporters, and conclusive evidence to those who are still hesitating before becoming subscribers that the Association is doing much, and could with adequate means do more, to advance the interests of the gas industry throughout not only this kingdom, but the entire English-speaking countries of the Empire.

EDWARD ALLEN, President.
F. W. GOODENOUGH, Chairman of Executive.

47, *Victoria Street, Westminster, S.W.*,
October, 1913.

Extraction of Thoria from Monazite Sand.

According to an article by Herr F. Wirth in the "Chemiker Zeitung" [Vol. XXXVII., p. 773], the formation of sparingly soluble double sulphates of earth metals is avoided by generating the anion of hypophosphoric acid directly in the acid liquor resulting from the decomposition of monazite sand. This is done by the anodic oxidation of copper phosphide in the solution, after first neutralizing the free acid present, so far as to leave the phosphates just dissolved. With an electromotive force of about 10 volts, the hypophosphate ions are at once converted into insoluble thorium salt. Oxidizers, like hydrogen peroxide, which give ozone on electrolysis, facilitate the process. Thorium may also be precipitated by alkali hypophosphate from feebly alkaline solution (*e.g.*, of the tartrate), and the solubility of thorium hypophosphate in a large excess of ammonium oxalate may be utilized for separating thorium, in alkaline solution, from trivalent earths, which are insoluble in ammonium oxalate. The thorium hypophosphate is treated as previously described. Cerium may be detected in neutral solution by adding 5 c.c. of 10 per cent. ammonium tartrate solution and 5 c.c. of dilute ammonia. The solution becomes yellow or yellowish-brown on boiling, or in the cold with 0·1 to 0·5 per cent. of cerium. Hydrogen peroxide gives a brown precipitate of cerium peroxide with concentrated alkaline solutions of cerium tartrate; and a coloration may be detected with 0·0002 gramme of cerium peroxide in 100 c.c.

THE NATIONAL GAS EXHIBITION.

INTERNATIONAL EXHIBITIONS HALLS, SHEPHERD'S BUSH.

[Entrance in Uxbridge Road.]

OCTOBER 1 TO NOVEMBER 1.

Organized by the Leading Gas Companies and Corporation Gas Committees of the United Kingdom and the Society of British Gas Industries.

President - SIR CORBET WOODALL, D.Sc., M.Inst.C.E.

PATRONS' DAY AT THE EXHIBITION.

Reception by Sir Corbet and Lady Woodall—A Brilliant Gathering.

It was just before three o'clock on Thursday afternoon that one left the Shepherd's Bush Station on the Central Tube, which station is showing quite a neighbourly concern in what is going on in the International Exhibitions Halls. Passing into the Uxbridge Road, there was seen a crowd of the leisured class, standing idly watching those who were ascending the steps to the entrance hall to the several galleries now tenanted by the popular demonstration of the gas industry. Across the way the footpath was also fringed by observant and curious individuals. Broughams, motor-cars, taxi-cabs, and various other equipages were rolling up to the edge of the pavement leading to the steps; and smartly dressed ladies, and black coated and silk-hatted gentlemen alighted and entered. It was the day of the reception by Sir Corbet and Lady Woodall of patrons of the exhibition and others; and those of the public who had not received special tickets or invitations were up to five o'clock only permitted entry by payment of 5s. There were some 5s. visitors during the day-time hours. Standing in the entrance hall, it was interesting to watch for a space the incoming visitors. There were lords and ladies, baronets and knights and their ladies, shining lights at the parliamentary bar, men who have place in the scientific firmament, and representatives of the technical professions. Belgravia and Mayfair were there. Gas men of high repute were seen, and many with their wives. Some of the chiefs among the manufacturers of gas apparatus and appliances, together with their wives, mingled with the rest. The stream of visitors continued to flow while watching; the stream of interest commenced to flow directly the turnstiles were passed. The number of visitors who entered during the hours when the ordinary tickets and the popular admission price were suspended was 2850, of which number 1600 had complimentary tickets. The number who were at the actual reception (by invitation) was 1200.

Passing up the halls, the visitors appeared to be in no great hurry to get to the reception; the reason being that the interest to right and left of them acted as a drag to progress. However, when the reception-room was reached, Sir Corbet and Lady Woodall had already been busily engaged with their visitors some half an hour. A graceful smile from Lady Woodall and a hand shake, and a friendly grip and word of welcome from the President of the Exhibition, and we passed in to the banqueting-hall. A pretty scene was here. Light refreshments were to be presently served to the guests. The long table down one side of the hall was heavily weighted by the light refreshments—the sandwiches, the dainty confections of all descriptions, the ices, the champagne cup, the claret cup, the tea, the coffee, and all else that one is in the habit of placing under the ample folds of the term "light refreshments." The long lines of tables, marshalled and spaced with disciplinary care, were prettily dressed. Standing ready to do the bidding of the guests, and compelling commands by the assiduity of their attentions, were numerous waiters. Host and hostess meanwhile steadily, and with the same gracefulness, continued to receive their guests. The tables were soon full, the space between them was well occupied, and circulating room became very modest. Friends met friends; strangers were being interested by their gas-engineering neighbours. We saw Mr. H. E. Jones in lively conversation up and down with old friends; there was the President of the Institution (Mr. Edward Allen) busy, and Miss Allen was with some of her lady friends; there was the Junior Vice-President (Mr. John Young), with Mrs. Young; and——we must stop somewhere, for if one deserves mention all do. The members of the Exhibition Executive were, of course, there, including the Chairman (Mr. F. W. Goodenough), the Vice-Chairman (Mr. H. M. Thornton), the Hon. Treasurer (Mr. D. Milne Watson), the Chairman of the Council of the Society of British Gas Industries (Mr. W. D. Helps), and the chief of the Editorial Committee (Mrs. M. A. Cloudesley Brereton).

The list of guests, we understand, included:

The Rt. Hon. The Viscount Hill, Lord and Lady Michelham, the Rt. Hon. Lord Merthyr, K.C.V.O., Lord Weardale, Sir Henry A. Miers (Principal of the University of London), Sir Francis F. Belsey and Lady Belsey, Sir John H. Bethell, Bt., M.P., and Lady Bethell, Sir Edward Brabrook, C.B., Sir William Bull, M.P., and Lady Bull, Sir Joseph Bellamy, J.P., J. H. Balfour Browne, Esq., K.C., Sir Arthur H. Church, K.C.V.O., and Lady Church, the President of the Institution of Municipal and County Engineers, Mrs. Cockrill, the Hon. Sir John Cockburn, K.C.M.G., M.D., and Lady Cockburn, Sir John Collie and Lady Collie, Sir Homewood and Lady Crawford, Sir Charles Alfred Cripps, K.C.V.O., K.C., M.P., Sir Anderson Critchett, Bt., C.V.O., F.R.C.S.E., Sir William Crookes, O.M., &c., and Lady Crookes, Sir Kenneth Crossley, Bart., Colonel Sir W. H. Dunn, Colonel Gascoigne, Colonel J. W. Garratt, Mr. and Mrs. Lister Godlee, Major and Mrs. Arthur Haggard, Colonel Sir Thomas Hungerford Holdich, Colonel G. M. Jackson, Lieut.-Col. A. S. Jones, V.C., Sir George Kekewich, K.C.B., and Lady Kekewich, Surg.-Gen. Sir Alfred Keogh, K.C.B., &c., and Lady Keogh, Lieut.-Col. Macdonell, Major and Mrs. Maynard, Professor and Mrs. Meldola, Sir Hugh Owen, G.C.B., Sir Hallewell Rogers, The Hon. Rollo Russell, M.A., Colonel Sir Alfred Somerset, K.C.B., and Lady Somerset, the Hon. Sir John Taverner and Lady Taverner, Sir George and Lady Truscott, the President of the Society of Architects, Mr. Douglas Walker, K.C., and Mrs. Walker, Mr. and Mrs. Herbert J. Waterlow, Sir George Welby, the President of the Surveyors' Institution, Sir Thomas Wrightson, Bart.

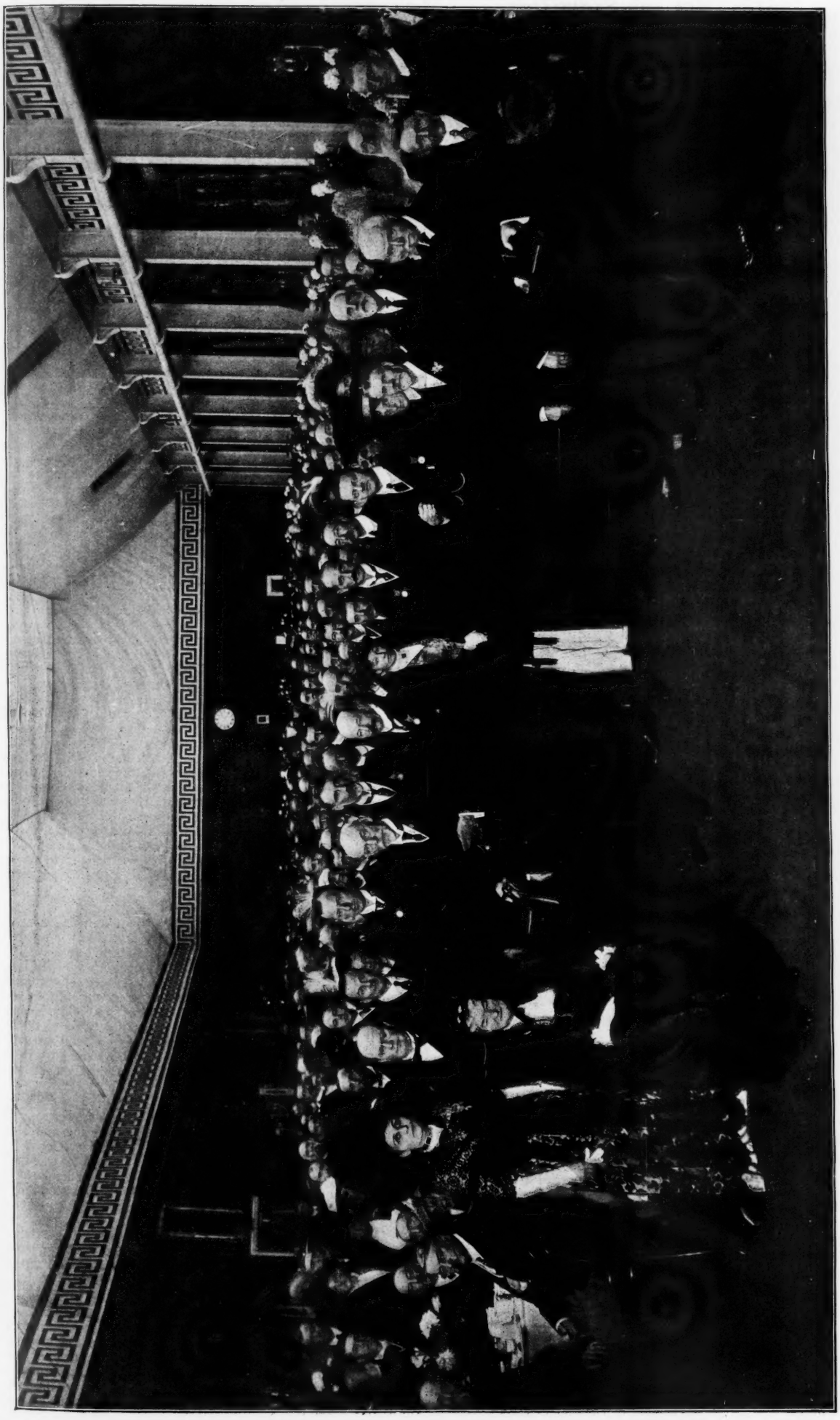
The municipal guests included:

The Mayors and Mayoresses of Bethnal Green, Blackpool, Buckingham, Darlington, Deptford, Finsbury, Hackney, Hammersmith, Henley-on-Thames, Holborn, Kingston-upon-Thames, Paddington, Poplar, St. Helens, St. Pancras, Saffron Walden, Southwark, West Ham, Wimbledon, and Workington. The Mayors of Bermondsey, Folkestone, Stockport, Walsall, and Westminster.

In the hall for some time it was an animated scene, full of life and colour, and charming and vivacious conversation. The Band of the Scots Guards played at intervals; and, interspersing the military music, Miss Annie Bartle and Mr. Charles Titheradge delighted the big audience with their interpretations of several songs. Mr. H. Scott Baker was the accompanist; and there was indebtedness to Messrs. Brinsmead and Sons, Limited, for the piano. At one part of the afternoon, when the hall was full, a photographic record of the scene was taken by Messrs. Avery and Co., which we have pleasure in reproducing,

Passing out into the corridors, one found these almost as full of life as inside the banqueting hall. Time was on the wing; and wandering down into the public lighting section, one found the visitors had penetrated even to that the least attractive spot in the whole exhibition, excepting for those servants of the public who are responsible for the lighting of our highways and by-ways after dusk. Retracing steps, the corridors between here and the galleries in which the exhibits of greater attraction to the public are displayed were barred every few paces against rapid locomotion. The barriers were pleasant ones; for the cordial handshake and the cheery greeting, the gossip, the news, the transient joke, all added to the pleasures of the occasion. In all parts of the exhibition, the guests wandered—admiring here, and gaining information there. After five o'clock the turnstiles again gave admittance by ordinary ticket and the normal admission price. The galleries again became filled with a constant, but ever-varying in composition, stream of visitors. It was getting late when we left, but life in all parts of the halls was at good height.

Patrons' Day and the reception by Sir Corbet and Lady Woodall must be given a high place among the daily recurring successes of the exhibition.



PATRONS' DAY AT THE EXHIBITION—A VIEW IN THE BANQUETING-HALL AFTER THE RECEPTION BY SIR CORBET AND LADY WOODALL.

NOTES FROM THE EXHIBITION.

THE Exhibition grows in popularity. Saturday, of course, is the crowded day of the week. But every day there are throngs of people whom one has never seen before; and there is gratification all round over the success. Last week, day by day saw increases upon the numbers passing through the turnstiles; and, compared with the corresponding days of the preceding weeks, the enlargement of numbers ranged from 50 to about 75 per cent. This is good. May it continue.

The estimate of Saturday night's visitors was from 10,000 to 12,000.

One gas engineer from a provincial town a considerable distance away mentioned, in conversation, that, on the invitation of his Committee, a number of the managers of industrial concerns in his gas-supply district have visited the exhibition. Already he has had to put through an order for a good gas-consuming appliance for industrial use. The manager from whom this order came had not seen anything of the kind before; and it was not the sort of thing that a gas undertaking keeps in its show-room.

Another hint. On the invitation of the gas authority in one town, eight doctors out of the twelve practising ones have visited the exhibition. One or two of them left home possessed by ancient theories as to the deleteriousness of gas heating. They returned home with new convictions. One of them has since ordered gas-fires for his own house. This is a provincial case.

Further undertakings have sent local journalists from their towns to see and report for themselves.

Remember the exhibition is not going to last for ever. It is a unique opportunity for showing representative local men the numberless applications of gas in a way with which the local show-room cannot vie.

The staff of attendants all through the exhibition report public interest and inquiry regarding the lighting and heating appliances under their charge. Automatic lighting arrangements, inverted burners, gas-fires, and water-heating apparatus, cooking ovens, irons, and other appliances for the kitchen are attracting attention. It is interesting for a gas man to mingle with the inquirers, and listen. That the educational work of the gas industry has much ground to cover is more and more evident day by day.

However, every visitor to the exhibition who carries away new information about gas and its uses, is a fresh "advertising agent" for the gas industry, and every new appliance that is fixed as a consequence of the exhibition may be placed in the same category.

The industrial exhibits also attract a vast amount of attention. We do not know which is most popular—the laundry, mantle making, the 'prentice boys, the meter makers, or the printers. They all, including the furnaces in the industrial heating section—shown from cherry red to white incandescence—have awarded to them much popular notice.

The opening of the exhibition, receptions, and functions of this kind are not the only times that the President of the Exhibition (Sir Corbet Woodall, D.Sc.) is seen there. He happens in at all sorts of unexpected times, and makes an inspection of the whole of the halls, passing a word here and there with the attendants, and generally ascertaining for himself how things are going.

One retired veteran of the gas industry whom Sir Corbet was glad to meet last Wednesday was Mr. William North, erstwhile of Stourbridge; and many more were glad to see their old friend at the reception on Thursday—well and as upstanding as ever. So much is this the case that he looks as though, despite his age, he still ought to be on the active list.

The President of the Institution of Gas Engineers (Mr. Edward Allen, M.Inst.C.E.) has been showing notable industry in connection with the exhibition. His presence has been so constant, that we have rarely been there without seeing him. He has been at the beck and call of Mr. Goodenough, and has been most helpful in many ways. An enthusiasm that prompts a man to give up a summer holiday in order to devote the best part of a month to the work that is going forward at the exhibition, is worthy of notice. The President is enjoying his novel and well-deserved "holiday" immensely; and he varies it, a friend tells us, by making flying visits to Liverpool in order to meet his Chairman (Mr. H. Wade Deacon, J.P.) and Board in connection with the Company's projected Bill for the next parliamentary session. This week, as President of the British Commercial Gas Association, Mr. Allen will have a busy time.

Touching a certain Manchester University lecture, we were glad to meet at the exhibition our excellent friend Mr. F. D. Marshall, and to have an opportunity of shaking hands with him. A little criticism of his views makes no difference to his friendship. We hope, however, that the visit to the exhibition has assisted in the modification of any views as to the prospective grounding of the gas industry in respect of any part of its business, and as to the need of any co-operation between the gas and electricity industries. As mentioned in the leader columns last week, Mr. Thomas Goulden, the Chief Engineer of the Gaslight and Coke Company, is of opinion that the industry's work lies in the direction of carbonizing coal so as to get as many B.Th.U. into the holders per ton of coal as is possible, and place those B.Th.U. in the possession of gas consumers at as low a price as possible. Mr. Marshall has other views about carbonization for gas and residuals production. Our two friends are linked together by ties of a closer order than professional ones; but their views on this point apparently differ very widely. If a vote of the professional men of the industry were taken, Mr. Goulden would have a thumping majority.

It is a big programme that the B.C.G.A. have in hand for this week. The papers, we understand, are to be of an exhilarating character; and some of them ought to be eye-openers as to the extent of business that awaits development by the industry. If we could only measure separately the amount of coal used in the industry of the United Kingdom, the amount still used in cooking, the amount consumed in the warming of buildings, and the amount consumed in heating water, it would give some idea of what is before the industry ere it says there is no more scope for business, apart from lighting. To-day's sittings of the Association will be in the Guildhall of the City of London; and the second day's sittings at the exhibition.

The administrators of gas undertakings great and small in many places in the United Kingdom continue to come to the exhibition. A number of these visitors seem to know us, but we have to confess we do not know all of them. One is heartily accosted here and there by men, but one cannot always put names to them. However, that is a matter of small moment. We are glad to see them, pleased to shake hands, glad to know that the majority are unfeignedly gratified with what is to be seen at the exhibition, and joyed to observe the general air of prosperity that environs them. It all speaks well for the gas industry. The bringing of our administrators into closer touch with the general affairs of the industry is doing an immense amount of good.

Would that we could find time and space to mention all representatives of Gas Boards and Gas Committees whom we meet. It cannot be done. But here are two or three examples. In the company of Mr. Fred. W. Taylor, the Engineer and Secretary of the Harpenden Gas Company, we saw Mr. T. H. Martin, the former chief at Barnet. In his retirement, Mr. Martin keeps himself in close touch with gas affairs, not only as a reader of the "JOURNAL," but as a Director of the Harpenden Gas Company. We met Mr. R. G. Shadbolt the other night escorting his Chairman (Mr. J. G. Thompson, J.P.) round the exhibition, and had an interesting chat with the latter gentleman. Almost simultaneously, Mr. B. W. Smith was seen with the Mayor of Walsall (Mr. Councillor John Venables) and one of his fellow-councillors. They were up for the reception by Sir Corbet and Lady Woodall; but owing to the crowd on Thursday, they had to return to Shepherd's Bush on Friday morning to make a more particular inspection of the vast display. Mr. Venables is the Chairman of the Gas Committee; and he is so popular among his colleagues and in the borough that he was re-elected Mayor after having served the normal term of office.

A good example is supplied to other manufacturing firms by Messrs. James Keith and Blackman Co., Limited. They have taken advantage of the National Gas Exhibition to have their principal representatives from the Provinces to see the latest developments in gas lighting. The representatives visited the exhibition on Friday evening; and, without exception, they were all thoroughly impressed with what they saw. The evening wound up in a very pleasant manner at a long table in the restaurant, where the inner man was ministered to. That the action of the firm was much appreciated by all who took part in the function was evident; and the gathering broke up then as always a happy family.

Last Tuesday night, when Professor Vivian B. Lewes repeated his first lecture on "The Evolution of Gas Lighting and Heating"—the first having been delivered on Thursday, Oct. 2 [see "JOURNAL," Oct. 7, p. 33], Mr. D. Milne Watson, who was in the chair, very aptly expressed the enthusiasm of the audience at the close by remarking that, even if the exhibition consisted only of Professor Vivian Lewes, it would be well worth a visit. It must be very pleasing to the Professor to see the way in which the announcement of his lectures is instrumental in drawing audiences which, on practically every occasion, have filled the large lecture hall. He repeated his second lecture on Wednesday, and his third one on Friday; and to both of them the same remarks apply.

Professor Lewes, in repeating his second lecture, on the Evolution of Gas Lighting and Heating, on Wednesday last week, incidentally remarked that he hoped by the time the next gas exhibition was held that there will have been enough commonsense in England to still further establish the heating power of gas as a test in preference to candle power. Candle power in gas was a thing of the past, and should be abolished. Gas was now burned

in incandescent mantles and in gas-stoves; and in very few cases was a flat-flame burner still being used. He therefore put in a strong plea that the prejudice of about 1 per cent. of gas consumers should not be allowed to stand in the way of universal progress.

Call a spade a spade, gas-fires gas-radiators, and the misnamed gas-radiators gas-convectors, and then Dr. Leonard Hill will be satisfied.

The one mistake of the exhibition has been to have some of the conferences at hours when people are the busiest with their ordinary day affairs.

Mr. A. H. Seabrook, the Borough Electrical Engineer of the St. Marylebone Council, and Mr. H. H. Holmes, the Sales Manager under Mr. Seabrook, were observed making a very critical inspection of the exhibition on Monday night last week. Mr. Seabrook has probably done as much as, if not more than, most electrical engineers in the matter of fighting gas.

Mr. J. Christie, the Chief Electrical Engineer to the Brighton Corporation, and an immediate Past-President of the Incorporated Municipal Electrical Association, was among the audience that listened to Professor Vivian Lewes's third lecture on Friday. Mr. Christie has been very active in pushing electric cooking and heating in his district; and no doubt he found the remarks of Professor Lewes upon the question of gas heating particularly interesting.

On Wednesday, the Wales and Monmouthshire District Institution of Gas Engineers and Managers paid an official visit to the exhibition. Some well-known members were among the party, which included the President (Mr. H. D. Madden, of Cardiff), and the indefatigable Hon. Secretary (Mr. Octavius Thomas, of Pentre). The Newport Gas Company were specially well represented by Alderman Thomas Canning, Mr. J. H. Canning, and the Secretary (Mr. T. H. Hazell). For some of them, of course, it was not the first visit. In fact, Alderman Canning and Mr. Hazell had previously been to the exhibition with the whole of their Board of Directors, who were highly pleased with what they saw. No doubt the party last Wednesday would have been larger but for the fact that some of the members of the Wales Institution will be coming up next week for the annual conference of the British Commercial Gas Association, and could not well spare the time for two visits so close together. The gas industry, too, is particularly busy just now in Wales; and this gratifying condition of affairs may also have been responsible for some absences. No Institution business was transacted; but the members had lunch together in the exhibition.

Some of the party foregathered also at tea; and it was then that a story was related concerning one of the members present —Mr. A. E. Davey, the Engineer and Secretary of the Aberdare and Aberaman Consumers' Gas Company. Finding, it seems, that the electric light installation would not pay alone, the Aberdare Urban District Council decided to run a tramway system in conjunction with it. The necessary tickets for this were to be supplied by a firm on condition that they were allowed to advertise on them at a very low rate indeed; and the firm circularized Aberdare traders, announcing their readiness to accept advertisements for the tickets. Mr. Davey thereupon lost no time in securing this excellent advertising medium for a period of three years; the advertisement arranged being, if memory serves, somewhat as follows: "The utility of gas makes it your best friend. Cheaper than electricity. Save your profits. Use gas for cooking, lighting, and heating. For further information, apply to the Gas Company, Aberdare." The users of the Council tramcars should benefit substantially by this good advice.

Twenty-five members of the Irish Association of Gas Managers visited the exhibition on Friday. They were met at the entrance hall by Mr. R. G. Shadbolt, who, in addition to being a member of the Executive Committee, is also a member of the Irish Association. This large muster from the Sister Island was a very satisfactory one; and the members turned up in force at the conference during the day, and also subsequently at the third lecture by Professor Vivian Lewes in the evening.

Further with regard to emphasizing the advantages of gas, the London correspondent of the "Newcastle Daily Chronicle" writes that during a visit to the exhibition a somewhat novel enterprise was brought to his notice. Believing that a pictorial representation of a great local industry would be useful as well as instructive, Mr. Thomas Waddom, the Secretary of the Newcastle-upon-Tyne and Gateshead Gas Company, has devised a scheme by which every phase of coal production will shortly be seen at the picture halls. Judging from the description given, the film should prove of a very "taking" character indeed. It will, one learns, demonstrate the operations of coal mining and shipping, as well as the process of gas manufacture, and the various uses to which the gas is put. The pictures of the coal workings could not (for want of light) be taken underground; but this was a difficulty which was surmounted by the construction of an imitation mine. For the coal unloading and gas manufacturing processes, it appears that Beckton has been laid under tribute.

Those members who were able to take part in the joint visit of the English and Scottish Junior Gas Associations to the exhibition on Saturday were impressed by the crowds which filled every part of the halls. This large attendance, while gratifying from the point of view of the exhibition authorities, of course, made a close scrutiny of the exhibits a matter of time and perseverance. But many had had, or were looking forward to, an opportunity of making a thorough inspection at some quieter time. Saturday's visit was thoroughly enjoyed; and the willingness of Mr. F. W. Goodenough to spare an hour out of his busy day to preside at the tea was much appreciated, as was also the presence of Mr. Edward Allen (President of the Institution of Gas Engineers), Mr. Alexander Wilson, Mr. R. G. Shadbolt, and other gentlemen who have taken an active interest in the Junior Association movement. The tea itself was a pleasant function, to which about 200 ladies and gentlemen sat down; and the few short speeches made were to the point, though some of the words may have been lost in space.

That so many juniors should have assembled in London at one time, especially considering the absence of special travelling facilities, says a good deal for their keenness, as well as for the attractions of the exhibition. So far as it was possible to gather, about 25 journeyed from Scotland, undeterred by a stiff railway fare, some 50 came from the Manchester district, a dozen from Yorkshire, and 30 from the Midlands—most of the latter, however, were not, unfortunately, able to reach London until early in the afternoon.

The second contingent of employees of the Birmingham Corporation Gas Department were at the exhibition on Saturday, in charge of Mr. R. G. Marsh. The party, numbering about 150, came up in reserved compartments on a train leaving Birmingham at midday. Luncheon was provided on the journey, as well as a ticket for refreshment available in the exhibition; and the conditions generally attaching to the visit were the same as those noted last week in connection with the first contingent.

We are threatened with a new gas publication. But it is only to be of a temporary character; and we are afraid its circulation will be somewhat limited. The conception of the new example of literature was formed in the clubroom at the exhibition. The editor—let his name not be announced until we have seen the first number, in case there are any persons who for reasons of their own will be trying to ascertain his identity and whereabouts. The plans for the paper contemplate contributors—with more or less literary ability—from among the frequenters of the exhibition and clubroom. There is to be wisdom from the editorial pen; and through the words in which it is conveyed, we shall ascend to wonderful heights regarding beauty and righteousness of co-operative effort, as well as have our vision directed to the expanse and richness of the land of promise that lies before the gas industry. A number of matters pertinent to the exhibition are likely to be a feature; some jokes gathered in the paths and by-paths of the exhibition are part of the scheme; and one gentleman, who is competent in many parts—scientific, legal, and golfing—has been burning some midnight gas at his domicile in writing poetry —he having appointed himself poet laureate to the exhibition. What will happen as a result of his effort, we are not prepared to say. The first number of the projected publication has not yet been seen. It is hoped the task has not been found too great for the editor (not M.A.C.B); but if the first number does appear, the editor may be petitioned to allow it to be the last.

There is a person living at Croydon, who bears the name of A. C. Bostel. He writes to the "Electrical Review" asking why electric ventilators have been fixed in the exhibition, instead of relying upon gas as the ventilating medium. Then he goes on in this particularly silly strain: "Perhaps it is because, there being no white ceilings for the calcined microbes to stick to, or convenient porous plaster for their charred remains to ooze through, the managers remove the cremated bodies from the building into the pure atmosphere to ooze into the lungs of the passing crowd." The composition is bad; the suggestions absurd. The use of the fans is explained by anyone with a little common sense located in the region of his brains. In the first place, in a demonstration of this kind, an enormous amount of gas must be used in various ways, and the heat would be considerable with so many open furnaces, water-boilers, gas-fires, water-heaters, and gas-engines in use. To have fixed ventilating gas-lamps throughout the upper part of these long glass roofed galleries would have been a fairly big and inconvenient job; the driving of holes through the stucco panels of the buildings was an easy one. The gas industry among many other things wanted to demonstrate to large users of electricity for power and lighting, how they can be—and economically —their own producers of electrical energy. The powers that be suggested to the exhibition organizers that, in view of the generation of current, the energy might be applied to ventilating-fans, which, under the circumstances, formed a very convenient method of accomplishing the work. We are glad A. C. Bostel signed his name. Why he wrote to the "Electrical Review" we are not aware—perhaps because he knew that the "Review" sometimes opens its columns to ludicrous as well as to serious matters.

CONFERENCE ON THE HYGIENE OF LIGHTING AND HEATING.

ANOTHER of the conferences arranged in connection with the exhibition was held last Tuesday, when the session was given up to the important question of the hygiene of lighting and heating. Three papers were submitted. At the opening of the proceedings, the chair was occupied by Sir RICKMAN J. GODLEE, Bart., M.B., the President of the Royal College of Surgeons.

The CHAIRMAN explained that his appearance as Chairman of the Conference was in order to show that the medical profession took an interest in the objects of the exhibition, which he understood to be not so much of a commercial nature—although there was, of course, a commercial element in it—but principally to try to educate the public on the question of what could be done with gas in the way of efficient heating and lighting, and, more important than that, the possibilities of the combination of good ventilation with good lighting and heating. He had had an opportunity of closely inspecting the exhibition; and the first thing which had appealed to him on passing through the first hall was the pleasantness of the atmosphere, which was warm enough without being suffocating. What also naturally struck the medical man was the exhibit which showed all the products of the distillation of coal, and particularly was he personally interested in such products as the creosote, carbolic acid, izal, and others which were of such considerable importance to surgeons. In addition to this, he was immensely impressed with the beautiful colours which were made from coal-tar products; and however much one regretted the fact that the indigo trade had been nearly ruined by the introduction of artificial indigo, it was impossible not to recognize the importance of these colours to everybody, and especially to the medical profession, because of their value in staining microscopic sections, and in other ways. He had also noted the great heap of sulphate of ammonia, which was a most important material in agriculture, and, being a bit of an agriculturist himself, he had also been struck with the enormous size of the cabbages, potatoes, and turnips which the use of sulphate of ammonia had enabled to be produced. He had specially noticed the great improvements in the appearance of gas-fires during the course of the last few years, and also in the character of the heat thrown out. In both these respects was the gas-stove much more pleasing and satisfactory than it used to be. This, he believed, was because arrangements had been made for carrying away the heated air of the room, which was heated now by radiant heat and not by superheated air. Another important matter was the ease and satisfaction with which hot water could be obtained—a most important thing in every hospital, where it was often necessary to get the sterilizers heated up at a moment's notice, and a patient operated upon probably within half an hour. Another noticeable feature was the way in which lighting and ventilation were combined; and he could not help thinking that arrangements such as those in the lecture hall might very well be introduced into some of our hospital wards—they were already in some churches—and so enable us to get efficient and satisfactory lighting, and at the same time very greatly improve the ventilation of the rooms. A most important point in regard to the heating arrangements was that, owing to the smokeless character of the heat producer, we were now reaching a stage in which we might see, within the comparatively near future, the possibility of a considerable diminution of the smoke in our great cities, rendering them much more habitable and more healthy and comfortable to live in. This, it appeared to him, was one of the most important outcomes of the movement which the exhibition had been started to introduce to the public.

Dr. SAMUEL RIDEAL then read his paper on

THE HYGIENE OF GAS FOR LIGHTING.

Dr. RIDEAL dealt in a convincing manner with this subject, and in his opening remarks pointed to the work of the City of Glasgow, in 1909, in making exact comparative trials on a practical scale as to which was better for heating houses—coal or gas—as regarded efficiency, healthiness, and economy; the question being decided in favour of gas on all three heads. The report was given in full in the "JOURNAL" for Jan. 4, 1910 (p. 39). Dr. Rideal then alluded to his own series of comparative trials on a practical scale of the relative hygienic values of gas and electricity as used for ordinary domestic lighting. An account of these trials will be found in the "JOURNAL" for March 10 and 17, 1908 (pp. 613, 688). He remarked that the alterations brought about in the air of the room by the human contributions far exceeded those from either gas or electricity; while, in confirmation of the popular idea that electric light is more trying for the eyes than gas light, the records of ophthalmic experiments were distinctly in favour of gas lighting. The humidity results throughout the experiments showed remarkably close agreements with electricity and gas—proving that the illuminant has but little effect in this direction. Dr. Rideal proceeded as follows.

The amount of carbon monoxide in air forms a very delicate test for the presence of unburnt coal gas due to any leak. This can be determined by Nicloux's process. I have investigated the physiological effects of a large coal-gas leakage. Three subjects were shut in a room of 2500 cubic feet capacity for 4 hours 20 minutes, in which 8·8 cubic feet of gas per hour was allowed to escape. This was calculated from the carbon monoxide and ventilation determinations to correspond to a permanent leakage of 0·9 cubic foot per hour. Before entering, their pulses, respirations, body temperatures, diastolic and systolic blood pressures, the corpuscular richness of their blood, and body weights, were accurately taken. When in the room, all these observations were repeated at nearly hourly intervals, and symptoms constantly noted. The air was fanned for two minutes every quarter of an hour, to insure a proper mixing.

It is sufficient to note that no serious symptoms became manifest. In fact, in the case of one subject, pulsation in the temples was the only inconvenience felt; the other two were more affected. All, after a time, lost their sense of smelling gas while in the room, though it was described by those outside the door of the room as "very strong," and could not under any ordinary circumstances have remained long undetected. The physiological observations showed but a slight rise in the pulse rate; but a considerable rise in two instances of the respirations, and only a slight rise in the other subject. The blood pressures afforded no information. In one instance the difference between the diastolic and systolic pressures increased, in another it diminished, while in the third it remained the same. There was well-marked relative increase in the coloured corpuscles; and this has been noticed to occur with the inhalation of carbon monoxide and coal gas. The loss of body weight was very little in excess of the average. From this experiment, the inference is that, in any quantity of gas likely to escape from any ordinary leakage, there is no fear of any immediate danger to health.

As to the wastefulness of open fires, these only render available 13 per cent. of the total heat capable of being yielded by coal or coke,and only 6 per cent. of that by wood; the rest being lost in the air and unconsumed carbon escaping up the chimney. While all forms of heating by radiation must be costly, in this respect the modern gas-fire, yielding about 50 per cent. of its total heat, shows a great saving. Radiant heat, though less economical, is generally preferred to convected heat; and there is little doubt that rooms heated by hot air, steam-pipes, or stoves are not so comfortable or hygienic as those in which radiant heat alone is employed. Headaches and stuffiness are caused by the former methods of heating; and Professor Leonard Hill and Mr. Muecke, of the London Throat Hospital, have shown that colds in the head are determined by the influence of warm, moist, confined atmospheres on the mucous membrane of the nose and throat. They find that the convected heat from an anthracite stove flushes and swells the nasal mucous membrane; but that the radiant heat from a modern gas-fire causes sweating of the skin, and does not affect the nose. In heated moist rooms, the swollen mucous membrane is easily infected by the sneezing of other occupants of the room; and then, on going out into the cooler air, the defensive mechanism of the blood does not work sufficiently rapidly to prevent the infection from growing in the secretion and swollen nose tissues.

Smoke is a direct cause of disease, since it leads to conditions which conduce to many forms of illness, especially of the respiratory organs. One out of five London fogs is entirely caused by smoke, and every town fog is intensified by it. A series of bad fogs immediately sends up the death-rate, sometimes doubling it. A Glasgow fog in 1909 is held guilty of 1063 deaths; while a London one is estimated to have occasioned or aggravated 30,000 cases of illness. In the heart of London, 83 per cent. of the sunshine so necessary for health is lost through the persistent smoke haze. If anyone stands on the top of Hampstead Heath, he can see the smoke pall over the city; and it is similar with other great towns. We have all noticed that windows are often closed to exclude smuts, thus shutting out fresh air.

At the present time, when so much attention is being directed to the healthy home, town planning, and suburban development, the subjects of heating, lighting, and air pollution are of immense importance. Even without any legal enactment on the point, it is the duty of every householder to discontinue so far as possible the domestic use of coal. In London the gas consumption is now over 8000 cubic feet per head of the population per annum; but this is far ahead of other cities of the world, and of smaller towns in the Provinces. The increase in London is mainly due to the development of the use of gas for cooking and heating; and I hope that special educational efforts will be made by other towns to imitate this example. The Glasgow Corporation, who are now among the most enlightened of municipalities on this smoke-abatement question, in the summer decided to let out on the hire-purchase system automatic gas hot-water circulators, which the Corporation fix to the existing hot-water installation to be used alone or in conjunction with the existing kitchen-range; and it is to be hoped that this example will be widely followed.

Most of the companies now lend gas appliances at cheap rates. In London there were 46,000 gas-cookers, gas-fires, and water-heaters in use in 1891; and twenty years later (in 1912) they had increased to 1,494,000. The water-heaters yield abundant hot

water very quickly; the cookers, while easily managed and cleaned, actually cost less than coal. Water-heaters should be provided with a thermostat, to shut down the flame when the water gets hot enough. In this way the bye-pass gas consumption can be as low as 3 cubic feet per hour, costing not more than 2d. per day (far less than coal would cost) to keep 20 gallons of water at 150° Fahr. ready for use, *plus* about 1d. for every 20 gallons actually used. It is a simple matter for the builder to arrange so that the supply and the piping shall be suitable for all the purposes for which gas is used.

The proper employment of gas utilizes money and labour most profitably, besides contributing to the cleanliness and healthiness of homes; while the raw product coal, which is a national asset, will be increased in value. My friend, Dr. Rudolf Lessing, the other day at the British Association Meeting, calculated that if all household coal were carbonized before being used for domestic purposes, not only would the "smoke nuisance" be abolished, but, at 20 gallons per ton, 700 million gallons of liquid fuel per annum would be obtained, or some fifteen times the quantity of liquid fuel required for the Navy.

The CHAIRMAN said he would like just to allude to the last thing referred to by Dr. Rideal, relating to the statistics which appeared to show that cancer was caused by sulphur. He would like to remind the audience how very dangerous it was to trust statistics at all with regard to the incidence of cancer. We had been shocked by the assertion that cancer had become very much more common during the past few years; but it was open to doubt whether this did not really depend upon the fact that people lived longer than they used to, and thus more frequently reached the age at which cancer was common. Similarly, with regard to the assertion that cancer was more common in agricultural districts than in manufacturing districts, exactly the same explanation applied—namely, that people in the country live to a good old age, old enough to become cancerous subjects. He did not say that the statistics of Dr. Rideal with regard to sulphur and cancer were not true, because he had not examined them; but they must be very careful with regard to the adoption of any statistics, however specious and obvious they seemed, with regard to this most difficult subject.

There were no further comments upon Dr. Rideal's paper.

THE HEALTH VALUE OF RADIANT HEAT.

Dr. LEONARD HILL, M.B., F.R.S., then presented his paper on "The Health Value of Radiant Heat," and introduced it by some general remarks concerning ventilation as a whole. The true doctrine of ventilation, he said, was one that must be spread most urgently all over the country, as there were very many misconceptions on the matter among people. He proceeded to remark that, in rooms where a plenum system is employed, and the warmed air is driven in so that the feet are kept colder than the body and head, the atmospheric conditions tend to constrict the blood vessels on the skin—thus stopping sweating, and increasing the congestion of the mucous membrane of the air passages. Radiant heat and open windows, with the cold morning air, have just the opposite effect. These conditions bring the skin into play, and keep the mucous membranes of the air passages pale, taut, and more immune to catarrhal infection. In this respect, he said, we have found the modern gas-fire, with its high efficiency in radiant heat, superior to the anthracite stove or gas convector (commonly and wrongly called "radiator"). We feel the greater comfort of radiant heat, and recognize the cause of this comfort. The radiant heat warms us unequally; we are not blanketed with warm air. It warms the floor and furniture. The source of radiant heat being placed close to the floor, our feet are kept warmer than our heads. There are inequalities in the air temperature of the room, not uniformity. Varying air currents are set up by the radiant heat warming the walls and furniture. Warmed by the radiant heat, we are able to bear the windows open and a lower air temperature. The action of the flue, by drawing fresh air, prevents the drying of the air.

The open fire and open window give us the ideal methods of domestic heating and ventilating. The open fire gives us radiant heat and ceaseless ventilation in the source of heat. It is full of beauty, too. There is romance in the play of flame; and it requires our attention, and so relieves the monotony of occupation. But the open fire is extravagant in fuel, darkens the atmosphere, dirties our environment, and depresses our spirits by depriving us of our full measure of sunlight and cheerful scenery. You must seek for methods of radiant heat which least pollute the atmosphere; and here the modern gas-fire merits consideration. I am speaking of the modern gas-fire fitted with an efficient flue, and giving 50 per cent. of the fuel value as radiant heat. I am not speaking of old-fashioned gas-fires, nor of gas-convectors, so-called radiators. I will not place the least blessing on these.

The thermometer is an instrument of very limited value for determining the comfort of the body; for it does not show the cooling effect of moving air or the change in cutaneous excitations produced by variations in strength and direction of wind and the sources of radiant heat. To estimate the comfortable and healthy physical conditions of the atmosphere, we need an instrument which will measure, not the average temperature, but the rate of heat lost. For this purpose I have invented the Kata thermometer. The Kata thermometers—I use two, one a wet and the other a dry bulb—are both large bulbed spirit thermometers of a standard size. Marks are made on the stems of each at 110°, 100°, and 90° Fahr. The bulb of the wet instrument is covered with a finger-stall taken from a muslin glove. Both bulbs are sunk in water at a temperature just too hot to bear the hand in. When the menisci have risen well above the 110° mark, the instruments are withdrawn; and the uncovered one is rapidly dried, while from the other the excess of water is jerked off. The instruments are now suspended in the atmosphere; and the time required for the meniscus of each to drop from 110° to 100° and from 100° to 90° is taken with a watch. Readings may be taken with the instruments exposed to, or screened from, a source of radiant heat.

With the help of the Kata thermometers, I have studied the conditions in a small room alternately heated with an anthracite stove and with a gas-fire. The anthracite stove gave off, of the heat of the coal burned, approximately 10 per cent. as radiant heat, 50 per cent. as convected heat, and 40 per cent. as flue heat. The rate of combustion was 14 per cent. per hour when full of coal. The gas-fire used by me gave off 41·7 per cent. as radiant heat, 29·7 per cent. as convected heat, and 28·6 per cent. as flue heat. The latest pattern of gas-fire gave off 52·1 per cent. as radiant heat, 23·4 per cent. as convection heat, and 24·5 per cent. as flue heat. These figures were determined for me by Mr. James Yates in his laboratory, with an apparatus specially designed for the purpose. [A short account of the method adopted by the Leeds Joint Committee for determining the radiation from a gas-fire (with which "JOURNAL" readers are familiar), as used by Messrs. John Wright and Co., was added as an appendix to the paper.] The results obtained showed me that with the gas-fire there is, in different parts of the room, less uniformity of the rate of heat loss; that the feet and legs are warmed by radiant heat, while the head is cooler; that one side of the body is warmed by the radiant heat, while the other side is cool; and that the radiant heat provokes sweating. On the other hand, the convected heat tends to make the air at head-level warmer than at the feet-level, and swells up the mucous membrane of the nose, and so causes the stuffy feelings of which people complain in close rooms.

I append figures [see p. 216] which show the effect of screening the radiant heat from the Kata thermometers.

At the conclusion of his paper, in the course of some remarks upon the monotony of a gas-fire, the author expressed the hope that gas-fire manufacturers would try to design a fire which would have all the variations now associated with the coal-fire. He was having one made in which, by means of a clockwork arrangement, the flame from the gas would wobble up and down, and he was going to see how he liked it.

The CHAIRMAN said it was quite clear that Dr. Hill would like to knock out all the windows from our houses, after the manner of sanatoria. It certainly was most striking to see people, accustomed to living under ordinary conditions, living in sanatoria with no windows, without the slightest ill-effects. It was clear that if all our windows were to be taken away, some sort of fire would be necessary; and he looked forward with a certain amount of interest to the introduction of the new spasmodic fire which Dr. Hill had referred to. However much one might admire the beauties of the various forms of gas-stove in the exhibition, he confessed that he regarded the coal-fire as a kind of friend to sit by.

A MEMBER OF THE AUDIENCE asked Dr. Hill what percentage of radiant heat was given by an ordinary coal-fire.

Mr. JACQUES ABADY asked Dr. Hill if he would kindly explain in greater particularity the application of his new form of thermometer to the investigation of the conditions in rooms when heated by convection and by radiation.

Dr. HILL, in reply, emphasized the point that radiant heat from a modern gas-fire resembled as nearly as possible the natural conditions of sunshine out of doors, inasmuch as the heat rays, falling upon a person, only heated him where they struck him; he was not in what might be called a blanket of hot moist air, such as was the case when a room was warmed by convected heat. The ideal to aim at was to keep the temperature near the floor warm, and the air above, which had to be breathed, cooler (the natural conditions on a sunshiny day); and these were fulfilled to a large extent by a radiant-heat stove. With reference to the radiant heat of a coal-fire, it was impossible to give figures, as it was continually varying. When coal was put on, the radiant heat dropped down to a minimum; and when the coal became red-hot, the radiant heat rose to an enormous extent. It was impossible to get measurements from any constant condition at all; the only way would be to average the figures up. The radiant heat measurements referred to in his paper had not been carried out by himself, but had been done for him by Mr. Yates, by the method adopted by the Leeds Joint Committee for determining the radiation from a gas-fire—the experiments being carried out in Mr. Yates's laboratory at Birmingham. He himself was quite satisfied that the experiments had been performed in a proper manner. With regard to his instrument, with ordinary wet and dry bulb thermometers round a room, very little difference was shown; but with his instrument the rate of cooling in any part of a room could be observed, and any alterations in the rate of cooling could also be found out similarly—whether the rate of cooling was quicker in one part than in another part of the room. The instrument would also show the effect of radiant heat, because it could be screened from the heat. The effect of a draught was to bring about very rapid cooling. Another interesting thing was that a thick brown woollen glove could be put round the bulb and

Anthracite Stove.

Experiment.	Wet Kata Thermometer. 100°—90° Fahr.			Dry Kata Thermometer. 100°—90° Fahr.			Average Temperature of Walls.	Temperature Height of Head.	Floor Temperature.
	Exposed to Radiant Heat.	Screened.	Difference.	Exposed to Radiant Heat.	Screened.	Difference.			
1	75 sec.	77 sec.	+ 2	242 sec.	228 sec.	− 14	69°	69°	68½°
2	90	93	+ 3	277	229	− 48	74	75	73½
3	83	84	+ 1	257	249	− 8	70½	71	69½
4	84	85	+ 1	252	223	− 29	71	72	70
5	82	86	+ 4	279	278	− 1	73	73	69½
6	84	88	+ 4	331	279	− 52	75	75	74½
7	76	81	+ 5	252	233	− 19	71	72	71
8	79	79	0	275	260	− 15	73	74	72

Gas-Fire.

Experiment.	Wet Kata Thermometer. 100°—90° Fahr.			Dry Kata Thermometer. 100°—90° Fahr.			Average Temperature of Walls.	Temperature Height of Head.	Floor Temperature.
	Exposed to Radiant Heat.	Screened.	Difference.	Exposed to Radiant Heat.	Screened.	Difference.			
1	95 sec.	79 sec.	− 16	365 sec.	220 sec.	− 145	75°	74°	86½°
2	73	71	− 2	313	192	− 121	75	74	86½
3	89	74	− 15	420	258	− 162	75	75	76½
4	87	71	− 16	703	254	− 449	77	76	82½
5	68	68	0	314	213	− 100	70	70	72½
6	73	73	0	339	235	− 104	72	73	76½
7	81	74	− 7	437	240	− 197	74	74	77½

The fire was regulated so as to keep the wall temperatures approximately the same as in the comparable experiments with the anthracite stove.

exposed to the warmth of a gas-fire. The glove would pick up the radiant heat and absorb it, and the rate of cooling would be tremendously prolonged. If, on the other hand, a white glove was put round, it would scatter the radiant rays, just like a white garment; and the instrument would cool very much quicker. In this way it was possible to demonstrate the effect of clothes and the colour of clothes.

Mr. D. Milne Watson then proposed a vote of thanks to Drs. Rideal and Hill for their exceedingly interesting lectures. He was fully acquainted with the valuable experimental work which Dr. Rideal had carried out; and speaking with regard to Dr. Hill's paper, the prospect opened up by his reference to his eccentric fire was not a little disturbing to the gas industry, because, after all, the whole of the industry had been spending its time for the last twenty years trying to invent a fire which would not be subject to variation, and which would not jump and leap about, but would give the monotony which Dr. Hill appeared to think was such an enemy. [Laughter.]

The vote of thanks was seconded, and carried with acclamation.

Dr. Hill proposed a vote of thanks to Sir Rickman Godlee for presiding. It was, he said, a really great kindness for such an illustrious surgeon and such a busy man, at such an awkward time of the day, to come and take the chair.

Mr. F. W. Goodenough seconded, and expressed regret that it was impossible for Sir Rickman Godlee to resume the chair after the adjournment.

The vote of thanks, having then been put to the meeting, was carried.

When the conference resumed after tea, Dr. Leonard Hill took the chair.

Professor Vivian B. Lewes then read his paper on

MODERN IMPROVEMENTS IN GAS LIGHTING AND HEATING APPLIANCES.

Professor Lewes, after a brief reference to the results that were attainable with the incandescent mantle, went on to say that it is when one comes to consider the progress made in heating by gas that one finds that the most hygienic advance has been made, as, when the idea first arose of making a gas-stove for domestic heating, it was thought that, as gas in its combustion gave no smoke, no flue to carry off the products of combustion was needed, and as under these conditions no loss of heat took place in the flue gases, nearly the whole of the thermal value of the gas could be utilized.

The flueless gas-fire, which, on account of its economy, struggled on for years, and in some forms is hardly now abolished, has done the gas industry more harm than any other factor; and had it not been for the wonderful advances made in the more modern stoves doing much to allay the prejudices that the old stoves had created against gas-fires, the great advance in the use of coal gas as a domestic fuel would not have been possible. Even when the absolute necessity of carrying away all the products of combustion had been grasped, two factors were overlooked, or, at any rate, not thoroughly understood. These were: (1) The action of cool material on the bunsen flame. (2) That heating the solid bodies in a room and providing cool air for the functions of the body were a necessity. It will be well to discuss these two points before passing to the modern stove, as upon their importance being properly grasped much of the success in gas-stove constructions depends.

If a cold substance, metal or non-metal, be placed in a flame, whether it be luminous or non-luminous, it will be observed that there is a clear space in which no combustion is taking place formed round the cool surface, and that, as the body gets heated, this space grows less and less, until, when the substance is at the same temperature as the flame itself, there is contact between the two. Moreover, when a luminous flame is employed in this experiment, the space still exists between the cool body and the flame; but it is also noticed that the luminosity is decreased over a still larger area, though the flame exists.

This means that in immediate contact with the cold body the temperature is so reduced that the flame cannot continue burning, and so is extinguished over a small area; while over a still larger space the temperature is so reduced that it is not hot enough to bring about decomposition of the heavy hydrocarbons, with liberation of carbon, to the same extent as in the hotter portions of the flame. Inasmuch as when water is heated or boiled in an open vessel the temperature cannot rise above 100° C., and as the temperature of an ordinary flame is over 1600° C., it is evident that the burning gas can never be in contact with the bottom of the vessel, or, in other words, the gas is put out before combustion is completed, and the unburnt gas and products of incomplete combustion find their way into the air. The portion of the flame which is supposed to be the hottest is about half an inch above the tip of the inner cone of the flame; and it is at this point that most vessels containing water to be heated are made to impinge on the flame. It is this portion of the flame, also, which is utilized for raising various solids to a temperatnre at which they will radiate heat.

In order to gain an insight into the actions taking place, the composition of the products of combustion was determined, and also the unburnt gases escaping when a vessel containing water at the ordinary temperature is heated to the boiling-point by a gas-flame; the vessel being placed, in the first case, half an inch above the inner cone of the flame, and in the second at the extreme outer tip of the flame.

Gases Escaping during Checked Combustion.

	Bunsen Flame. Inner.		Outer.
Nitrogen	75·75	..	79·77
Water vapour	13·47	..	14·29
Carbon dioxide	2·99	..	5·15
Carbon monoxide	3·69	..	*nil*
Methane	0·51	..	0·31
Acetylene	0·04	..	*nil*
Hydrogen	3·55	..	0·47
	100·00		100·00

These figures are of the greatest interest, as they show conclusively that the extreme top of the bunsen flame is the only portion of the flame which can be used for heating a solid substance without liberating the deleterious gases; and they also make clear the numerous cases of carbon monoxide poisoning which occurred with the old forms of geysers, in which water circulating in a metal coil was heated by flames in contact with the metal, and the products allowed to escape into the air.

In the earlier forms of gas-stove, the so-called "artificial fuel"

consisted of balls and skeleton masses of fire-clay and asbestos, packed into the grate or arranged, perhaps in considerable depth, in the front of the gas-stove; their function being to radiate heat when the temperature of incandescence was reached. No particular arrangement was adopted to give the burner flame a free passage through the mass, with the result that, for a considerable period, the flames were distorted and cooled; and as the importance of proportioning the screen or hood above the fuel so as to prevent any of the products of combustion escaping into the room had not been grasped, and the heat had not had time to create a good chimney-draught, the lighting of the early forms of gas-fires invariably tainted the air of the room, and with sensitive constitutions often gave headache.

The heavier and thicker the form of the artificial fuel, the longer will it take before its temperature begins to approximate to that of the flame, and the longer will be the period over which poisonous effluent gases will be produced; and as the amount of radiation rises rapidly with increase in temperature, a heavy mass of artificial fuel, which heats only slowly and never reaches a high incandescent condition, never can give any high radiative efficiency. An incandescent mantle made of material having high radiant powers for heat would be the ideal artificial fuel, as it would reach the temperature of the flame in a fraction of a minute, and would translate the largest proportion of the heat of combustion into radiant heat; but this is not a practical possibility, on account of the fragility of the mass. In the modern gas-stove, the front fuel is made with walls as thin as is compatible with the necessary strength, and in such forms that it can be arranged to touch only the outer skin and tip of the atmospheric burner flame, where, as we have seen, the combustion of the gas is practically complete; so that not only is the hottest portion of the flame utilized, but the formation of deleterious products of incomplete combustion is done away with.

Another point of the greatest importance in the modern stove is the proportioning the area of the outlet-pipe that is to lead the products of combustion into the flue, with regard to the position of the screen or hood that is to prevent any products from the front of the fire escaping into the room. If the flue is too large and the hood low down, so large a volume of air is drawn in from the room that, in its rush over the surface of the incandescent fuel, it cools it down and lowers the radiant efficiency of the stove; while, if not large enough and the hood too high, there is the liability of the escape of products into the room. The great argument in favour of the open coal-fire has been that, though it sins beyond forgiveness in its wastefulness and in the fouling of the air, yet the heat which escaped up the chimney created such a draught that from 10,000 to 40,000 cubic feet of air from the room were withdrawn in an hour, so that it became an important engine of ventilation. It would be impossible to drag this amount of air through a gas-fire without deadening its radiant efficiency. But the gas-fire never looks so well as when it is set into a screen of glazed tiles; and I have always felt that if the exit from the stove into the flue was made to pass into a sheet-iron Venturi tube, the bottom of which was in connection with a series of ventilating tiles in the screen, but a few inches away from the stove, just as much air could be withdrawn from the room, and quite as good a ventilating effect secured, without affecting the fire. In the old form of gas-fire, the fuel usually was kept in position by metal bars or gratings, which interfered considerably with radiation; but with the modern forms of fuel these have disappeared, and nothing checks the path of the rays.

Having now gained an idea of the importance of reducing any cooling action in the flame to a minimum by raising the temperature of the artificial fuel to the highest possible temperature in the shortest possible time, we can discuss the second factor, which is still more important—and that is, that the heat should be so emitted into the room from the stove that the solid bodies should be warmed, while the air must be left cool for carrying on the functions of the body. This can be done only by radiant heat, and there can be no doubt as to this being the correct method of heating. If we consider the way in which the earth is warmed by the sun, we see that even on a hot summer's day the air is not heated directly by the sun's rays, but that they raise the temperature of the solid bodies with which they come in contact, and these bodies, in turn, slowly part with some of the heat to the surrounding air, so that the air is kept fresh and cool for breathing and for the various processes of nature.

Cool air is more healthy to breathe than hot air; but there is another point to be considered in the utilization of heat for warming. According to the laws of radiation, any solid body which is at a higher temperature than others around it will part with some of its surplus heat by radiation to them at a rate which varies with their temperature. If, now, a person be seated in a room heated by an open fire, the radiant heat from the fire warms the walls and solid objects in the rooms to a temperature more nearly approaching the body temperature, and minimizes radiation from the body, so preventing chill; and at the same time the air is raised in temperature only very slowly by convection from the hotter solids. If, however, the room be heated by hot-water pipes, hot air, or steam, the temperature is raised by convection. The air in the neighbourhood of the hot pipes gets heated, expands, and rises, so setting up convection currents until the whole of the air in the room is raised to a certain temperature. This heat, however, is imparted very gradually to the walls and furniture, which remain for some considerable time at a much lower temperature than that of the air. The result of this is that the person sitting in the room experiences a sensation of chill; his body at a normal temperature of 98° Fahr. readily parting with some of its heat to the cold walls and solids in the room.

The most important point, however, to be considered in comparing the hygienic character of radiant heat with convected heat, is that when you are in a room heated by radiant heat your body is warmed, as well as the other solids in the room, by the rays; and if the original temperature of the room was 50° Fahr. (10° C.), you would feel thoroughly warm and comfortable when the air temperature had risen to 59° Fahr., while if the warming of your body was left to convected heat the air temperature would be raised probably to 68° Fahr. (20° C.) before the same sensation of warmth was attained. The warmer air is not only in its capacity for moisture greater, but for each degree rise in temperature the amount of moisture it is capable of taking up is greater than for the preceding degree rise; so that though a cubic foot of air at 59° Fahr. is saturated by 5·5 grains of moisture, it takes double this quantity to saturate it when heated to 80° Fahr. In other words, 20° Fahr. rise above 59° Fahr. does as much in giving a certain volume of air a capacity for taking up moisture as the whole range of temperature below. Air is practically never saturated, and the further it is from its saturation-point the more rapidly will moisture evaporate into it; while when it is saturated evaporation at that temperature stops. So that if air at 80° Fahr. contained 11 grains of moisture per cubic foot, there would be no evaporation into it; while air at 60° Fahr. containing only 2 grains, would cause rapid evaporation, because it wants nearly another 4 grains to saturate it.

The practical point is that, starting with the room at 50° Fahr., the air probably not being more than two-thirds saturated, on warming the air to 59° Fahr, we increase its power of taking up moisture; and if we go to 68° Fahr., evaporation becomes so rapid from every exposed surface in the room capable of giving up moisture, the plants droop, and human beings soon feel oppressed and uncomfortable—smarting eyes and a dry throat being early symptoms of the over-rapid evaporation. In the older forms of gas-stove, which gave only some 25 per cent. of the heat as radiant heat, and in which efficiency in heating was obtained by the use of hot-air chambers and other devices that gave a large proportion of convected heat, this trouble became so marked that a bowl of water to supply moisture to the over-heated air became a common adjunct to the gas-stove. But with the modern gas-fire, which gives 45 to 50 per cent. of the thermal value of the gas as radiant heat, and only 12 to 20 per cent. as convected, this trouble has ceased; and with very few exceptions the gas-fire of to-day is every whit as healthful as, and infinitely cleaner and more convenient than, the open coal-fire.

The CHAIRMAN said he could not helping feeling that this paper formed a perfect corollary to that which he himself had presented earlier in the proceedings on the physiological side—Professor Lewes having dealt with the chemical and physical side with masterly authority. The paper was an admirable summary of the physical conditions underlying the proper heating and ventilation of a room, and the suggestion made, of using a Venturi tube, was a most hopeful one. This effect was one of the good things of the open coal-fire—it did pull very much air out of the room; and if the makers could by any possible means get a gas-stove to pull out as much air as a coal-fire did, they would have made an enormous step to improve it. He urged them to try every means to see if the idea of Professor Lewes could be carried out successfully.

A SPEAKER asked whether the Venturi tube idea had ever been put into practice, or was it merely a theory not yet put into execution?

Professor LEWES said he did not think the principle of the Venturi tube had ever been applied to ventilation; but it would be an admirable thing if it could.

ANOTHER SPEAKER asked what was the effect of pulling out a certain amount of air from a room if the heat was pulled out as well. Did Professor Lewes mean, when speaking of the holes in the tiles around a gas-fire, that he would be able to draw out more air without pulling out the heat, or would he pull out the heat as well?

Professor LEWES replied that what he meant was that, if it was intended to convert an ordinary fire-grate into a gas-stove, the best method was to stand the fire right back against the grate, or, if they cared to go to the trouble and expense, take the grate out altogether. The best way, probably, was to stand it back against the grate. From the back of the stove they had the flue going up to a certain height by means of the elbow, and under ordinary conditions air was sucked through the fuel, which was wrong, and over the top and around the stove, which was right. In most cases, when one fitted a gas-stove, and wanted to make a good looking job of it, in the dining room or drawing room, tiles were used to fill in the front openings of the original stove; and this threw the onus of ventilation entirely on the openings over and through the incandescent fuel. The result was such a rush of air through it that the general efficiency was considerably lowered through a very much higher percentage of the heat being carried up the chimney. What he suggested was that these tiles, which were anything from 6 to 9 inches deep, could be made with the outer tier 5 or 6 inches away from the stove itself, and perforated. The whole of the back portion of the old grate could then be used as a box into which these perforated tiles opened, and then, if at the top of the box the flue was fitted through which the hot

products of combustion, at a temperature of between 300° and 350°, were passing, and led into the conical portion of the Venturi tube at the top of the box, there would be obtained such a sucking into the box through these perforated tiles that would result in the same amount of air being got out of the room as with the grate, which, at the same time, would not draw it over the incandescent fuel and so interfere with the radiant effect.

A SPEAKER asked the reason why, in a certain gas apparatus which he called a radiator, when he closed the orifice which allowed the products of combustion to escape, "a most horrid stench arose."

Professor LEWES said the case which had been put to him was as excellent a one in teaching a lesson with regard to the use and abuse of gas-fires as could possibly be. Here was a radiator giving out its heat, or rather the products of combustion, through an opening at the top, and no smell arose, simply because the air supplied to the flame was so arranged that there was complete combustion—the products of combustion consisting of carbon dioxide, water vapour, and residual nitrogen. This was the radiator when working at its best, which was, nevertheless, a very bad best. But when one placed over the top of the opening in the flue a plate so as to stop the upward flow of the convected heat, one stopped the only ventilation from below upwards—which was the natural passage of ventilation owing to heated gases always rising—and so one checked the combustion of the burner, which gave off carbon monoxide, acetylene, and half-a-hundred other products but little known, by incomplete combustion; and an already unhealthy method of heating had been converted into an absolute danger. Precisely the same thing happened when one tampered with the flue and drew off the products from an ordinary kitchener. When the full opening was allowed, the products were flowing away, because there was complete combustion; but the moment anything was done which produced incomplete combustion, there was, luckily, the smell which the speaker had so graphically described. He said "luckily," because the smell was the warning note which safeguarded us against an improperly burning stove.

Mr. F. W. GOODENOUGH said it was a serious thing to find oneself in disagreement with a learned gentleman like Professor Lewes; but he felt he must say one or two words in connection with his wholesale condemnation of radiators as being radically wrong methods of heating under any circumstances, because he was unable to agree with this. He was a great believer in heating by radiation, and a great believer in the disadvantage of overheating the air. But there were many circumstances in which heat was required, where there was a large body of air to heat, in order to bring about a more comfortable condition, such as in corridors, halls, large shops, &c., where there were no possible means of heating by radiant fires, and where the only alternative was a system of heating by radiators, so-called, or not heating at all. They had heard from Dr. Hill that afternoon that a very small increase of carbon dioxide was of no importance whatever, and the only products of combustion given off in a perfect-combustion radiator were carbon dioxide and water. The gas industry therefore claimed that, for large air spaces where ventilation was good, a gas-heated radiator was an exceedingly proper method of heating, and did not produce any unhealthy conditions. The industry never recommended radiators for closely confined spaces; but for places where there was a large body of air to heat, and the ventilation was good, very often a gas-heated radiator was the only workable thing, and was not an unhygienic method of heating. It was for this reason that he ventured to differ from Professor Lewes in his wholesale condemnation of gas radiators.

Professor LEWES jocularly asked if they ever knew of a really clever gas man—and he ventured to say that Mr. Goodenough was the cleverest in London—who was sufficiently brazen in his trade convictions to condemn what he was pleased to call his radiator, simply because the radiator was an easy way of heating a large volume of air, and, if properly used, could be employed up to a certain point. It would be the finest day's work for the gas industry that ever was done if they boldly called the gas-radiator a gas "convector" ["Hear, hear"]; and if, at the same time, they would only supply it for places such as large halls, large staircases, and under conditions where a small trace of the material that must be got away would not cause trouble. He agreed with Mr. Goodenough to this extent. Take the case of a large school room, which it was more important to properly ventilate than anything else. The housemaid, one of the modern ones, came down at a quarter to eight in the morning—breakfast being at eight o'clock. The result was that if the gas-fires were only lit at that time it was absolutely impossible to get the rooms heated up by radiant heat to a temperature in which the children ought to come and sit before commencing their classes. There ought to be a definition made of the amount of heat which was allowed to be convected. He had pointed out that, when warmed up by radiant heat, the only heat given to the air was that convected from the solids in the room, which had been heated by radiant heat, and therefore the solids had to be heated up to a fairly high temperature before the air was touched at all. With a class of anæmic, delicate little mortals who could not stand fairly fresh air, it was permissible to use a small proportion—say, 12 to 15 per cent.—of convected heat, which the ordinary gas-stove gave, so that, by the time the solids in the room were heated by the radiant heat to the proper temperature, the effect of the small percentage of convected heat would have resulted in bringing the room to the proper temperature for the children to come into; and he put in a very strong plea for the stove being so arranged as to give not more than, say, from 12 to 20 per cent. of convected heat, while at the same time giving the 50 per cent. radiant heat which the modern gas-stove now gave.

Mrs. M. A. CLOUDESLEY BRERETON, speaking on the domestic side of the problem, said she was an enthusiast for gas, and would have gas-stoves in every room in the house if she could possibly afford it; but she thought they were doing damage to the gas industry if they tried to make out a case which could not be borne out mathematically. It was said that a gas-fire was economical because it could be used when it was wanted and turned out when not required; but no drawing-room of any size, for instance, could be properly aired, nor could the furniture be properly aired, by the use of a gas-stove during the very short time that such rooms were usually in use. The same applied also to a middle-class house, where the best room was only used for a very short time each day. For this reason she agreed with Mr. Goodenough on the question of radiators, and believed that they had a legitimate use, after all that had been said that could be said against convected heat, because, putting a scientific fact in a simple way, the only kind of convected heat which was condemned by doctors was high temperature convected heat, and that which made the air so hot that there was what Dr. Hill called a blanket of hot air round one. But the convected heat, which kept the place just dry and comfortably warm, and down below the ordinary spring temperature, was not at all objectionable. On these grounds there seemed to be something to be said for the radiator, even in the small private house, while there would appear to be a distinct use for it in large houses for warming staircases and corridors.

Mr. JACQUES ABADY, who proposed a vote of thanks to Professor Lewes, said he would take the opportunity of briefly summarizing the interesting matter which had been placed before the conference. They had started with an admirably clear and intelligible account of the experiments which Dr. Rideal had carried out in regard to the chemical result of the combustion of gas in rooms, and they had learned from him facts which were not sufficiently known and appreciated—a want of knowledge and appreciation which had given rise to a great deal of misconception on the part of those who were inimical to the gas industry. They had learned, firstly, that there was no sulphuretted hydrogen in the gas supplied to the public; secondly, that the amount of sulphur compounds which gave rise to sulphurous acid was very small indeed, and had a less harmful effect upon rooms where gas was used than where coal was burned by open combustion; thirdly—and this was the point people did not seem to be able to appreciate sufficiently—the carbon dioxide that was given off was not a poison but simply an inert gas; fourthly, that the other product of combustion (water vapour), at the temperature at which it was evolved from combustion, mingled with the carbon dioxide, and instead of the products of combustion being heavier than air, as was generally supposed, and sinking to the floor and remaining in the room, on the contrary they were lighter than air, and gave rise in consequence to that ventilation which was such a very important feature of the use of gas. He did not think that gas people ought to act defensively with respect to the hygienic action of gas. Having right on their side, they should take an attacking position. He also took the opportunity of supporting Mr. Goodenough's views with respect to the use of gas-radiators compared with what Professor Lewes had said. He rather thought that Mr. Goodenough's view, even though he himself had put it before the meeting, had not been put as clearly as Mr. Goodenough had it in his own mind. It ought to be that, *per se*, there was nothing harmful in the use of radiators. The only thing that could be said against them was that they gave rise to heat which was convected and not radiant, and he believed that what Mr. Goodenough was urging was that there were occasions where a room was not suitable for being warmed by radiant heat, and that therefore it was quite right, in these circumstances, to employ so-called radiators or convectors, which did no harm, but afforded a useful, though perhaps not so pleasant, kind of heat as was obtained from an ordinary gas-fire.

The vote of thanks was seconded and carried; and the proceedings were brought to a close by the passing of a vote of thanks to the Chairman, Dr. Leonard Hill.

POPULAR LECTURE.

METHODS OF FIRE-MAKING: ANCIENT AND MODERN.

On Monday, Oct. 13, Mr. Miller Christy gave his popular lecture on the above subject. In it, he outlined the various methods of providing fire, from the early attempts of primitive man, who used what is known as the wood-friction process—that is, two pieces of wood were rubbed together, the resulting heap of wood dust being sufficiently hot through the friction to set smouldering some form of tinder, which was subsequently blown into flame. A description was given of the various designs of flints and steels which were used in the next developments of fire-making; and the gradual evolution of the present-day friction match was described in considerable detail by the aid of numerous lantern slides.

[The other "Popular Lectures" of last week are noticed on p. 224.]

CONFERENCE ON SCIENTIFIC ILLUMINATION.

THE second conference held during the past week was on some aspects of scientific illumination. This was on Friday; and three papers were submitted for consideration. The chair was taken by Lord RAYLEIGH, F.R.S.

Mr. F. W. GOODENOUGH, on behalf of the Executive Committee of the exhibition, thanked Lord Rayleigh for giving up his valuable time to preside over the conference, which he was sure everybody would greatly appreciate.

Lord RAYLEIGH said that the title of the conference—namely, some aspects of scientific illumination—might be taken in a good many different senses, although the importance of it was easily grasped. In order to see, the first thing to have was illumination; but when one had got light, this was not by any means everything, If it were a question of seeing something in black and white—such as a book—so long as the reader was not dazzled by the light, it was enough, as long as there was sufficient light on the book. But there were more complicated considerations which entered into the calculation; and perhaps this point could be more easily appreciated by taking an extreme case—the extreme case of uniform illumination coming equally in every direction. No particular difficulty arose as long as one was looking at objects which stopped the light altogether—such as printers' ink might be supposed to do, or when dealing with coloured objects. But when there was no absorption—*i.e.*, the body was wholly transparent to light (symbolized by, say, a tumbler of water)—the proposition he was going to lay down was that in a field of absolutely uniform illumination (in which the light came equally in all directions), a glass of water would be absolutely invisible. There would be nothing by which one could see, and the only way we did see it was by the light falling unequally in different directions. If the light fell upon it equally in all directions, whatever might be lost as regards light going in one direction by reflection or refraction, would be gained by light coming in another direction (which, by hypothesis, was the same thing), which would be added to such light. If we wanted to make the experiment in imagination, we should picture ourselves at the top of a monument in a thick fog which sent the light practically equally in all directions—apart from the fact that one's body was an obstacle which would interfere very materially and alter the circumstances of the case. He remembered putting this proposition some years ago; and it was interesting as an extreme case. But Professor Wood, of Baltimore, had made the experiment in a better form, by uniformly coating the interior of a box, almost completely closed (with the exception of a small eye-hole), with a phosphorescent paint, so as to give the light equally in all directions. He found that the experiment succeeded; and that a transparent object—such as a tumbler of water or a glass prism, or anything of the sort of sufficiently transparent material—could not be seen at all. This was an extreme case, showing that illumination was not everything, and that we required to consider other matters in order to tell what would be the effect upon the eye. He did not suppose, however, that this particular case was of much importance from the practical point of view; but the difficulty was generally rather the reverse, because artificial illuminants were not too diffused but too concentrated—particularly in the case of the modern electric lamp, in which a large amount of light was given from an exceedingly small filament. With gas, the difficulty was not so great; but although the original diffusion was somewhat greater, here again it was usually necessary to introduce some additional diffusion of the light in order to meet the ordinary requirements of the eye. He only made these few introductory remarks in order to point out the fact that the distribution of illumination was as important, or might be as important, as the amount of the illumination itself.

THE ILLUMINATING ENGINEERING SOCIETY.

Mr. LEON GASTER was the author of the first paper, which dealt with the aims and objects of the Illuminating Engineering Society, of which he is Hon. Secretary. He pointed out that seven years had passed since he first sought to obtain support for the project, but it was not until the autumn of 1907 that the idea was brought prominently forward. In the meantime he visited the Continent and the United States; and encouraged by the favourable views of the leading experts of these countries, he revived the idea in a paper before the Association of Engineers in Charge, and endeavoured to point out the valuable work such a society might do. Yet the support was not very encouraging. The starting of the "Illuminating Engineer" helped to explain the nature of the movement; and in 1909 the Society was formed. Now, many of those who originally opposed the idea have become its strongest supporters. After quoting from Professor Sylvanus Thompson's Inaugural Address at the first meeting, to show the aims of the Society, Mr. Gaster remarked that membership in the Society does not at present convey any professional status; and for the present they deprecate members describing themselves as illuminating engineers, feeling that the ideal "illuminating engineer," conversant with all aspects of the subject, has yet to be evolved.

Mr. Gaster, continuing, said: We particularly desire the support of the architectural profession, at present very insufficiently represented in our Society. We feel that, while the architect might often learn much from the engineer, the latter could also learn much from the architect; and that the influence of the Society, with the architect's assistance and support, could do much to bring home to the general public the possibilities of developing, not only more efficient, but also more beautiful, conditions of lighting. At present, it must be owned, the architect in whose hands the lighting of interiors so largely rests is often indifferent to these possibilities. We want him to take up illumination as an integral part of his work, and to help us to raise it to a higher artistic plane. In the same way, we feel that the influence of the medical profession should be exerted more strongly against methods of lighting detrimental to vision. All our impressions as to the beauty or utility of an interior are received through the eye; and, in designing a lighting installation, we should surely study the needs of this organ. At an early stage in the Society's proceedings the "glare" from artificial illuminants was discussed, and vast results have already followed from this discussion. The lighting engineer has been stimulated to design new and improved forms of shades and reflectors, screening the light from the eyes and producing a more restful efficient condition of illumination; and the medical profession are coming to recognize that they have a duty to apply their knowledge of the eye, acquired in the physiological laboratory, to practical problems in illumination. At the recent International Medical Congress, much was said on this point; but much more may yet be learnt by the closer co-operation of the medical profession and the illuminating engineer.

The influence of the Society on the design of simple instruments for the measurement of illumination, and the subjects discussed at the meetings, were then referred to; and it was pointed out that the Society have already arranged, in conjunction with other bodies, for committees on street lighting, school lighting, and library lighting. Acknowledgment was made of the wide publicity given in the Press to the work of the Society: and mention was made of the circulation of a booklet entitled "Light and Illumination; their Use and Misuse," which summarizes in a popular manner the rules of good lighting.

Let us, said Mr. Gaster, now turn to another aspect of the work of the Society—its international connection. Naturally, the same problems that interest us in this country are also occurring abroad. In illuminating engineering, we have early recognized the wisdom of international co-operation. Seeing that this is a new and developing science, and that conditions in different countries have not yet become standardized, the prospects of common agreement at an early stage seem bright. The Society receive the support of a very large number of distinguished corresponding members in various parts of the world, and their assistance will naturally be very valuable in arranging for international action.

There is need for more precise definition of the units, standards, terms, and symbols used in illuminating engineering; and many difficult problems in scientific photometry still remain to be threshed out. These questions cannot be settled by any section of the lighting industry. They need the joint consideration of representatives of various systems of illumination. In 1908, when, at a meeting of the International Electro-Technical Committee, the question of the standards of light was discussed, the author proposed that the co-operation of bodies representing the gas industries should be invited; and it was agreed that this should be done. Since that time, the principle of such joint action has been generally recognized. The need for international action on such points has already been responsible for the formation of an Illuminating Engineering Society in Germany, under the distinguished auspices of the Technisch-Physikalische Reichsanstalt of Charlottenburg, and with the support of the German Institutions of Gas and Electrical Engineers.

There are already in existence three Illuminating Engineering Societies in Great Britain, Germany, and the United States; and it is anticipated that a similar Society will shortly be formed in France. Already these societies have made provision for co-operation. But it is recognized that such co-operation should not apply only to purely scientific subjects, and that important work might be done in connection with many problems of practical importance—such as the measurement of light and illumination, the amount of illumination required for various industrial purposes, &c. Naturally, it would be an advantage for the requirements in this respect to be the subject of international agreement.

The desirability of such common action has also been pointed out at a number of international congresses at which the Illuminating Engineering Society were represented—for example, at the International Congress on Industrial Diseases (Brussels, 1910), the International Congress for the Prevention of Industrial Accidents (Milan, 1912), and at the International Electro-Technical Congress, held in Turin in 1911. At the annual congress of the Royal Institute of Public Health, held in Paris during the present year, a special section devoted to industrial hygiene was established for the first time; and in the discussion in this section, the consideration of industrial lighting played a prominent part. In the field of industrial lighting, such congresses are already leading to far-reaching results. The French Government have appointed a Committee on the Hygiene of Vision; and this year a similar Committee, charged with the duty of inquiring into industrial lighting, has also been appointed by the Home Office in this country. It would naturally be a benefit if similar committees

could be instituted in all the principal countries, so as to work in co-operation, and ultimately report at an international congress on the subject.

Meantime, the idea of an International Commission on Illumination, brought forward by the author at the International Electro-Technical Congress at Turin in 1911, has become an accomplished fact. Last month, at a conference held in Berlin, it was decided to form such a Commission by suitably enlarging the scope and membership of the Zürich International Photometric Commission, which was originally formed in 1900 in Paris, with a view to promoting researches on the photometry of gas. National committees on illumination will be appointed in all the chief countries; and the statutes provide that in countries where Illuminating Engineering Societies already exist, these may assume the functions of the national committee—a step which would considerably simplify the problem of providing for adequate representation of all systems of lighting. The example set by Germany in this respect could with advantage be followed in this country, where the Illuminating Engineering Society has already obtained recognition from the older and longer established institutions.

At the present moment it is impossible to predict the ultimate influence of this Commission; but we may be sure that it will have far-reaching and beneficial consequences to the lighting industries all over the world. The work of the whole illuminating engineering movement is such as to benefit all systems of lighting, as well as the outside public. We may hope that through its influence the jealousy and animosity between representatives of rival illuminants, already much modified by the events of the last few years, will gradually pass away.

In the Illuminating Engineering Society, the principle has always been to allow representatives of different systems of lighting to bring forward the claims of their own illuminants, but to abstain entirely from attacking other systems. May we hope that this principle will be adopted far and wide throughout both industries, and that the energy frittered away in mutual enmity and interference will be replaced by a determined effort to work together in fields where both can benefit. In the illuminating engineering movement, the author is convinced, there exists such a field. This has been fully recognized by the members of the Council of the Society, who, throughout its four years of existence, have worked together in an entirely friendly and harmonious manner.

Illuminating engineering, by stimulating the demand for better light, and raising illumination to a higher place in the public estimation, and by establishing an understanding as to what, exactly, the principles of good lighting really are, can do much for both industries.

In concluding this paper, the author would, therefore, like to make a strong appeal to the members of the gas industry to come forward and support the movement in greater numbers. We have before us an immense vista of useful work. We are making steady progress in the more technical aspects of illuminating engineering —such as the photometry of lamps, the determination of the polar curves of light distribution from globes, shades, and reflectors, and illuminating engineering calculations, all of which are gradually permeating the lighting industry, and are of great importance to those interested in the use of gas. We hope also to establish gradually the standard of illumination required for various purposes; and we are hastening towards the time when people will not think only of how much they can save on their lighting bill, but also will demand of a system of illumination that it shall be hygienic, artistic, and supremely well adapted to their needs. Through the help of the architectural and the medical professions, let us teach the public to appreciate good lighting as a means of preserving eyesight and beautifying the home. Let us make it clear to the manufacturer, the merchant, and the professional man that proper illumination is an essential element to the success of their work, and that inefficient lighting appliances are dear at any price. If the Illuminating Engineering Society were adequately supported, it is scarcely possible to set limits to what it might accomplish. But, in order to carry out its programme to the full, a more generous measure of support is now desirable. The problems on which it is engaged are of national importance; and there are several branches of its work which might well receive greater Government recognition and support.

Sir JOHN COCKBURN moved a vote of thanks to the author. In doing so, he said he did not think it was possible to over-estimate the value of such a Society, which was absolutely without prejudice in matters of illumination, and had for its sole objects the placing before the public of, and the calling of the attention of the scientific world to, the best means of illumination, taking all other factors into consideration, because the best means of illumination for one particular object might not be the best for another. Sometimes one wanted a very bright light, irrespective of consequences. When the brain was dull, and thoughts on a subject or article would not come, he had often found the greatest advantage from turning on every light available. It might be bad for the eyes and bad for the health; but it was necessary to get round a tight corner sometimes, and to stimulate the faculties in such circumstances, because, after all, light was one of the most important stimulents not only to the body but to the mind, and without light our faculties would gradually pass into abeyance. He had been specially interested in the details set out in the paper, and particularly in the remarks of the Chairman on the question of diffusion of light, and on the necessity of throwing the light on the body and keeping the source of light as far as possible from the eye. The ideal system of lighting, of course, was from the sun, where one obtained light without seeing the source; and the guidance given us from heaven was of importance to those connected not only with the work of illumination, but also with the matter of advertising and window signs, &c.

Mr. F. W. GOODENOUGH had much pleasure in seconding the vote of thanks to Mr. Gaster, not merely as Chairman of the Executive Committee of the conference, but as Chairman of the Council of the Illuminating Engineering Society. In this latter capacity, he had had the opportunity of observing the wonderful activity and zeal which Mr. Gaster had exercised in developing and forwarding the interests of the Illuminating Engineering Society; and he was glad of this opportunity of bearing his testimony to it. He was also glad to have the opportunity of bearing testimony to the harmony with which the representatives of gas and electricity had been able to work in the Society. Its President was Professor Sylvanus P. Thompson, who was one of the most distinguished representatives of the electrical industry living at the present day; and he was glad to say that, although he (Mr. Goodenough) in a very minor capacity represented gas, while Professor Thompson represented the electrical industry, they had both always been able to work together in the most friendly and cordial manner. The Council of the Society, too, which embodied representatives of all forms of illuminant, worked together without any friction whatever. Mr. Gaster had mentioned that at present nobody had the right, because of his membership of the Society, to use the term "illuminating engineer." He personally was hoping that the time was not far distant when this would be altered, and that there would be a qualifying examination in the principles of illumination which would entitle a man to use the term "Member of the Society of Illuminating Engineers" as meaning something more than the fact that he had paid a guinea a year. He (the speaker) believed it would be of value to the public to know that there were qualified illuminating engineers whom they could employ. Sir John Cockburn and Mr. Gaster had both referred to the increase of the standard of illumination required in modern days. This was, of course, only in parallel with the other increases in the standards of living at the present day. We had increased our standard of pace in traffic; and if our grandfathers or great-grandfathers could come back and attempt to cross the streets of London today, they would think that instead of returning to earth they had arrived at another place which one usually did not mention. No doubt this increase in the pace of traffic rendered it absolutely necessary that the standard of illumination in public thoroughfares should be increased, while avoiding what the Illuminating Engineering Society had always preached—an increase of glare. We wanted well-diffused light in our streets; and he would like to endorse Mr. Gaster's hope that before long we should be able to measure illumination as easily as we now measured heating, and that the use of a Lumeter would be as common as the use of a thermometer for measuring the heat of a room, although it was true that Dr. Leonard Hill had stated at a previous conference that a thermometer was a very misleading instrument in this connection.

Mr. R. G. SHADBOLT said he would like to remark, in the presence of the Chairman and Secretary of the Illuminating Engineering Society, how much the gas industry appreciated their efforts; but he had one fault to find as a set-off against this, and that was in connection with Mr. Gaster's grumble concerning the support he had received from the gas industry. The Society started from a national point of view; but it had since extended its influence and induced operations in other countries, which was all to the good. At the same time he was afraid that there was just a danger that our own country was being neglected. What he was referring to was more a matter of organization than anything else; and one reason that greater support was not forthcoming from the technical members of the gas industry was the very fact of their geographical situation. The Illuminating Engineering Society met a number of times during the year; and the fact that these meetings were in London constituted it purely a London society so far as its meetings were concerned. In the Provinces, however, there was a great amount of talent concentrated around the various industrial centres; and he ventured to suggest that it would assist very greatly in the promulgation of the aims of the Illuminating Engineering Society if the Council took into consideration the advisability of forming centres—keeping the Society itself as the national society. By this means, if something in the nature of local centres could be constituted to work in conjunction with the headquarters in London, he believed (speaking from the parochial more than the national point of view) the Society would achieve much greater success than it had done up to the present time.

The CHAIRMAN, speaking on the question of the co-operative action between the gas and electrical industries through the work of the Illuminating Engineering Society, said that there were no doubt many questions of interest to both these industries which were not antagonistic, but were on parallel lines. Reference had been made to the importance of light measurement, and there could be no doubt at all on this point. Looking at other industries, one saw that almost the first step towards an understanding of the practical side was an efficient system of measurement; and this was to be seen most strongly, perhaps, in the electrical industry. It so happened, fortunately, that electricity—owing to what the French call the canalization of it—was particularly easy of measurement; but even so, difficulties of measurement would not have been overcome at once if the way had not been prepared by the labours of scientific men before there was any-

thing that could be properly called the electrical industry at all. If we could measure light and illumination in some satisfactory way, and assign a figure to it, as Mr. Gaster had suggested, then the way was very largely cleared for ascertaining what was desirable and what was not desirable when it came to practical matters.

The vote of thanks having been carried,

Mr. GASTER thanked Mr. Shadbolt for his valuable suggestion, which, he said, would be brought before the Council of the Illuminating Engineering Society. The point was that a society must learn to walk before it could run; but if the Provinces wanted the Society to go there, it should be done.

LIGHT AND SIGHT.

Dr. MEREDITH YOUNG (Medical Officer of Health and Chief School Medical Officer, Cheshire County Council) contributed the final paper on "Light and Sight." This proved to be a valuable treatise on the subject dealt with; and we wish it were possible to reproduce it here. It is not, however; and brief notice must suffice. Referring to fatigue and the detrimental effects on the eye of certain lights, he remarked that we require some reliable method of measuring ultra-violet rays. Several have been suggested—*e.g.*, the use of sensitized paper, such as silver nitrate paper or Kodak "Solio" paper, or, as recommended by Schall, paper soaked in paraphenylendiamene nitrate. Both of these methods are, however, open to the objection (the first-named more particularly) that the visible rays of the spectrum also act on the sensitizing agents. The matter is of special importance in connection with the sterilization of water by ultra-violet rays, where a method of standardization is highly desirable.

Alluding to the effects of glare, the author said: Dr. Cameron Gibson has shown, by actual tests made on himself, the very marked manner in which strong light affects visual acuity. The left eye was exposed to the glare of a naked inverted incandescent mantle, at a distance of 24 inches for 60 seconds. Within half a minute (the time occupied in testing vision) visual acuity had dropped from 40/40 to 19/40; in 90 seconds it had recovered to a value of 34/40; and after another 60 seconds it was found to reach 39/40, or practically its normal again.

I have made similar tests on myself. My own normal unaided vision is 11·5/40. After staring for 30 seconds at a 50-candle-power Osram lamp at a distance of 27 inches, the immediate average reduction in my vision was 5·5/40 for the left eye (*i.e.*, down to 6/40), and 6/40 (down to 5·5/40) for the right eye; each eye being exposed and tested separately several times. Sixty seconds after the exposure the left eye recorded 8/40, and the right eye 7½/40. The left eye regained normal vision in 100 seconds, and the right in 110 seconds. There was a temporary blurring induced in each eye, which rendered vision testing somewhat difficult.

With an inverted incandescent gas-burner, similar exposure reduced the vision to 9·5/40 for the left eye, and 9/40 for the right eye; no blurring being observable. The left eye in 60 seconds had recovered to 10·5/40, and the right eye to 10/40; both eyes normal in 80 seconds. With an ordinary gas-burner, flat-flame (No. 5 Bray), the figures were as follows:—

	Right.	Left.
Vision after 30 seconds' exposure	10·0/40	10·5/40
Vision 60 seconds after removal from exposure	11·0/40	11·5/40

After gazing at an ordinary wax candle flame, vision was affected so slightly, and returned to normal so quickly, that no satisfactory tests were possible.

I may at this point remind you that eye strain does not cause any prominent symptoms in the eye itself. It is usually headache which is the chief symptom; and that headache may be in the forehead, the top of the cranium, or the back of the neck. One commonly observed peculiarity of this headache is that it disappears after a good night's rest, and remains away for some hours; but, if the patient resumes his ordinary occupation, it commences again pretty early in the day, and usually increases in intensity as the day wears on.

We know from every-day experience that anybody with normal nerves can work fairly comfortably in a perfect din of noise; and we are led to inquire whether the same principle applies to the eye as to the ear. Undoubtedly it does up to a certain point, but up to that point only. We must bear in mind that the eye is a more perfect organ, and one which is more easily distracted or strained than the ear. The noises of the street, of the office, of the factory, are more or less continuous. But a pistol shot in the midst of this continuous hum or roar would unquestionably distract attention. This is precisely what occurs when the eye is turned from an accustomed source of light to one which is even slightly aggressive; and it occurs precisely for the reason stated, that the eye is a much more sensitive organ.

Strong contrasts, too, throw a large amount of work on the iris or pupil and the retina. The eye is endeavouring to protect itself against bright points of light, while at the same time it is trying to make out details in the variously lighted areas. After a short time under these conditions of muscular and nervous strain, fatigue, and possibly injury to the eye, is bound to result. Professor Weber gives the maximum permissible contrast as 100 to 1. But it is not too much to say that in many lighting installations the contrast runs up as high as 4000 or 5000 to 1. As a general rule, it may be stated that a too bright light which comes within the field of vision does more harm than good. It may, and probably does, strongly illuminate the object on which illumination is desired; but the distraction, *plus* the unavoidable excessive pupillary contraction, causes an interference with vision which more than discounts this added local illumination.

The following remarks were made by the author, after a consideration of the effect of light on mental work. Gas lighting has been called hard names in the past by hygienists, chiefly on the ground of being an air-polluting agent. I think we must entirely abandon this attitude towards modern gas lighting; for Dr. Samuel Rideal, Professor Vivian B. Lewes, Mr. G. Stanley Cooper, and many others, have shown, beyond doubt, that there is no marked difference between the carbon dioxide content of the atmosphere (the factor on which the views of hygienists were chiefly founded) in the case of rooms lighted by incandescent gas compared with those lighted by electricity. The position now in connection with this aspect of the subject is clearly that the condemnation of gas as a polluting agent has been persistently and unduly overstated, and that the effect of gas as a ventilating agent has been just as improperly understated. If we are not far enough advanced in scientific knowledge to state precisely what the injurious ingredients or properties of a vitiated atmosphere are, we should have the courage to say so; and we might then soon arrive at the secret of the matter. I have said elsewhere, and I repeat now, that we are mere ostriches in this matter. There is something just as vitally important in the differences between impure and pure air as there is between human milk and cow's milk as substances to feed babies upon. We have got to find out now precisely where the difference lies between expired and pure air, and, I imagine, the carbonic acid bogey will then be finally laid to rest.

The feelings of discomfort which manifest themselves in a polluted atmosphere are really due to increased temperature, decreased humidity, offensive emanations from the persons and clothing of the occupants, and possibly to the destruction of some still undiscovered vitalizing constituent of the atmosphere. The increased temperature, as such, is not, in my opinion, a matter worth much consideration. The greater heat created by the incandescent gas mantle, as compared with electric light, has been found to influence ventilation favourably.

Dr. Rideal finds no difference in the humidity of the air of rooms lighted by gas and electricity respectively. You may take it from me, therefore, that from the sanitary or health point of view there is nothing to choose between gas and electric light. If anything, from this point of view gas has the advantage. Dr. Charles Oliver, Ophthalmic Surgeon to the Wills Eye Hospital and the Philadelphia Hospital, U.S.A., has given an unequivocal opinion, from the point of view of eyesight preservation, in favour of gas lighting.

I know quite a number of sound, thinking men who have electric light in their offices, but who would not at any time have anything but inverted incandescent gas-burners in their homes. They speak as men who have near work to do day in and day out; and they one and all complain of a wearying effect of electric light, many of them of headache and eye strain. They are not medical men, and their opinion, therefore, may by some be discounted as possibly due to indigestion, torpid livers, undiscovered ocular defects, and so on. But most of those whose opinion I quote have had their stomachs, livers, and eyes medically overhauled, and still adhere to the views I have quoted, and still refuse to be beguiled by promises of the saving of money if they would only instal electric light in their homes. This section of the population is no small one; and I am bound to confess that, in my opinion, they are in the right. I would not—could not conscientiously with the evidence I have before me—advise them that their views are wrong.

There is thus only one disadvantage attending the use of gas as compared with electric light, and that is the deterioration of internal decorations. One has noticed all too often that in rooms lighted by gas, just as in rooms heated by hot water or steam radiators, there is a patch of darkened ceiling or wall near the gas light or radiator. To what is this due? Is it that the particular source of light or heat sets up miniature dust-whirls, which drive any suspended dust particles, with some force or velocity, on to the nearest surface? Is it that the heat draws in currents of air containing dust particles, and drives these on to the nearest surface? It cannot, I imagine, be a mere effect of heat *per se*; as we know that even electric lamps, which are known to cause less of this blackening of surfaces near to them than gas, give rise to considerable heat, and when wrapped up in textile material, can set fire to it. We know that paraffin lamps and even candles or matches cause it. Is it caused by incomplete combustion of carbon particles which are driven on to the surface by the force of the heat generated in these open flames, and which are interrupted by the enclosing electric light globes? One does know, at all events, that carbon filaments, when nearing the end of their life, blacken the bulb of the lamp; and this is presumably due to the fact that the detached carbon particles are being filtered off by the interposed glass. There is no possibility, of course, of completely enclosing a gas flame like an electric lamp; but can there not be devised a "carbon filter," of asbestos or other material, which will rid the gas light of this very material drawback?

The next heading discussed was imitation of daylight; and in regard to this, the author said the spectroscopic examination of light sources was of interest. He was able, through the courtesy of Professor Vivian B. Lewes, to quote the subjoined figures, though he drew attention to the statement of the Professor that

he was unable to guarantee their accuracy, as their source could not at present be traced.

Colour in Spectrum.	Sun.	Electricity. Arc.	Electricity. Incand.	Coal Gas. Ordinary Flat Flame.	Coal Gas. Welsbach Mantle.	Acetylene. Alone.	Acetylene. With Air.
Red	1	2·09	1·48	4·07	0·37	1·83	1·03
Yellow	1	1·00	1·00	1·00	0·90	1·02	1·02
Green	1	0·99	0·62	0·47	4·30	0·76	0·71
Blue	1	0·87	0·91	1·27	0·74	1·94	1·46
Violet	1	1·03	0·17	0·15	0·83	1·07	1·07

Abney gives the following, taking the intensity of red as the unit:—

	Sunlight.	Carbon Arc.	Gaslight.
Red	100	100	109
Green	193	203	95
Violet	228	250	27

The spectrum of high-pressure gas is, I am informed by Mr. John Bond, said the author, quite similar to that of daylight, except that one does not get the Framböfer lines. The eye is not particularly sensitive to red, and the red end of the spectrum is of rather poor luminosity. Close upon 90 per cent. of the effective luminosity of white light is given by the rays corresponding to that part of the spectrum from about the centre of red to about the centre of green. These statements should render the production of a more perfect light a matter of no serious difficulty.

Some faults of artificial lighting, intrinsic brilliancy, ineffective shades, and the question of globes were next considered. On the the last-named point, the author quoted the following figures as giving some idea of the amount of light which is lost by the use of certain commonly employed globes—the figures indicating the percentage loss of light owing to the interposition of the globe.

	A. F. Bezant.	William King.	A. H. Wood.	F. H. Storer.
Clear glass	5 to 12	10·57	about 12	..
Ground glass (entire surface ground)	..	29·48	40	..
Smooth opal	25 to 60	52·83	60	..
Ground opal	..	55·85	..	..
Painted opal	..	73·98*	64	..
Ruby glass	85 to 95	..	..	89·62 Flat short $\frac{1}{16}$ in. thick
Green glass	80 to 90	..	..	81·97 Flat short $\frac{1}{16}$ in. thick

* Here it is stated that the painted figures intervened between the burner and the photometer-screen.

Then there were references to acetylene lighting, mirror reflectors, holophane shades, and the lighting of factories, schools, hospitals, kitchens, sculleries, and shop-windows. Concluding his remarks on the lighting of schools, the Doctor said: As regards the amount of light transmitted directly downwards from the lighting source on to the working plane, I believe it to be approximately as under:—

Direct methods	Three-quarters.
Indirect methods	*nil*
Semi-indirect methods	One-quarter.

The amount of light absorbed in the direct and semi-indirect methods appears to be approximately the same; but in the case of the indirect method a loss of 20 to 25 per cent. is apparently sustained.

While I am, from medical and hygienic points of view, favourably disposed towards semi-indirect lighting, there are three principal faults in the fittings commonly used. The first is that deep bowls or lower globes are often employed, which tend to the collection of dirt. Besides being insanitary, this interferes with the downward diffusion of light. Another fault is the use of heavy rings or supports for the bowl, which lead to undesirable shadow effects. The only other fault I know of is the use of absolutely unsuitable glass for the bowl. One has seen painted opal globes throwing grotesque figured shadows; ground opal globes which make the fitting all but an indirect one; purple or ruby globes which have the same inherent defect; and so on. The system is all too good to be spoilt by these chicaneries.

The chief fault in the indirect method of lighting appears to me to be that there is apt to be too much contrast between the extensive surface of brightly lighted ceiling and walls and the less brightly lighted working plane. There appears to be no question that this is apt to be distracting. If expense were no object, and one could have, in addition to the indirect general illumination, a slightly greater illumination on the working plane, this tendency to distraction would disappear. It is always a relief from eye strain, too, to be able to raise one's eyes from work and encounter a less brightly lighted area. This is experienced when one turns one's eyes from the glare of a white road on to a green field. When used in rooms with low ceilings or roofs, these drawbacks of indirect methods are somewhat violently accentuated.

These few extracts may be fittingly brought to an end by quoting the author's conclusions: When we know what illumination is required for various kinds of work, when we know what the human eye can reasonably stand in the matter of illumination, when we know what particular kind of light-rays the human eye is so far accustomed to, and able to use to advantage, when we know that with certain light-rays there is at all events something of a risk, and when we know that damage to eyesight is, to put it at the lowest, reparable only at the cost of some discomfort and inconvenience, I ask you, is it worth while taking any risks? What do we gain economically by creating a light source of immense candle power, if we have subsequently to arrange for its diffusion, reflection, and shading, so as to reduce it thereby to the required physiological standard? Surely here, as in most cases, "enough is as good as a feast."

In my opinion, the question of which is the best lighting system to adopt has been narrowed-down very closely as between the two principal aspirants—electricity and gas light. Both are agreed that excessive intrinsic brilliancy is to be avoided, that light obtruding on the field of vision is apt to be discommoding and injurious, that natural daylight is the standard at which to aim, that ventilation at all events is not to be handicapped, that the public must be persuaded that, within reasonable limits, too much light is better than too little light, and that special cases of lighting must still be worked out. The real issue between these two competing agencies is that of cost; and I have no doubt that you will be treated to innumerable bewildering sets of figures in this connection. All I can say to you on this point is—be guided by the bill you have to pay, and not by estimated costs of cubic feet of gas per hour, watts per candle power, polar curves, &c. If you know what you want, and I hope my remarks will help you to this end, you must "ask for it and see that you get" nothing "just as good."

Mr. R. G. Shadbolt, in proposing a vote of thanks to the author, said that the information given in the paper was the kind of thing which was being increasingly asked for by those practically engaged in the gas industry. It was essential that more knowledge should be available with regard to the eye, which was very readily affected not only by the high illuminating power now produced, but also by the high intrinsic brilliancy which was gradually being used for lighting thoroughfares. In connection with this it was necessary that we should be very, very careful indeed; otherwise, in the endeavour to provide something exceptionally good, the gas industry might kill the public by kindness—in other words, more harm that good might be done, and this matter could not be too forcibly discussed.

Mr. J. L. Chapman seconded the vote of thanks, and referred to the possibility of the effect of light upon the digestive organs. He had just returned from travelling in Austria, and there every little hotel generated its own electric light, and no particular care was taken as to the quantity used, because economy was not necessitated, since the electric light was generated by the water power from the mountain streams close by. It was found, during his sojourn in different hotels, that it was necessary to continually turn the light out, round about, to really properly enjoy their meals; and this circumstance had suggested to him the possibility that, from the mental point of view, the quantity of light around one had some detrimental effect upon the digestion.

The Chairman, in putting the vote to the meeting, said the paper covered an immense field; and it was not always an easy matter to arrive at an opinion on some of the points touched upon. It so happened that he had been interested in optics from boyhood, and had been accustomed to observe the working of his own eyesight. He was sorry to say that in recent years he had observed a good deal of failure in his eyesight, compared with what it had been in his early days; but the majority of mankind, he believed, observed very little in this direction. Possibly they found out that they required glasses as they got older; but they did not observe very particularly the cause. An interesting instance of this was the case of a very intelligent man who some years ago applied to him for the post of assistant in his laboratory; and, on being asked whether he was short-sighted, the man said his eyesight was quite good. But it happened that the optical experiments in view at the time required that the eye should be focussed over distances of what was known scientifically as infinity. He personally could do this quite well, but the assistant could not; and although he persisted in saying that he was not short-sighted, a test by means of a set of optician's glasses soon proved that he was very markedly short-sighted, and that he had never, all his life, been able to see distances properly. As a result he took to wearing glasses. This was a case of an exceptionally intelligent man who had never found out that he was short-sighted; and it was therefore most probable that few other people found it out also. One of the directions in which his own eyes had deteriorated almost more than in the loss of accommodation was in the tendency of stray light to obscure the vision. He presumed it was connected with some imperfect transparency of the lenses and fluids of the eye; so that, if there was a strong light falling on the optical parts of the eye, it was diffused over the retina and interfered with vision, especially in dark corners.

The vote of thanks was carried, and an adjournment was made for lunch.

THE ECONOMY OF EFFICIENT LIGHTING.

Mr. Franklin Thorp next read a long paper on this subject. After thanking the Committee responsible for the arrangement of the conference for the honour conferred upon him by enabling him to take part in it, the author remarked that Mr. Gaster, who had preceded him, had set forth the aims and objects of the Illuminating Engineering Society, and proved the necessity for a scientific study of artificial illumination. He (Mr. Thorp) understood that he was expected to show the advantage of applying correct methods in practice, and its influence on the balance-sheet; while Dr. Meredith Young, who was to follow him, would indicate the effect of unscientific illumination upon the eye. He

then went on to say that the economy of efficient lighting is generally acknowledged, and is perhaps best illustrated by taking the case of motor-car head lights. Two motor rides through dimly-lighted country lanes on a black night, one with and the other without good head lights, would convince even the most sceptical as to the economy of efficient lighting, not only in time and safety, but also with respect to the nervous tension of the individual. The example was, perhaps, an extreme one; but it certainly illustrated the contention for the need of sufficient light. Mr. Thorp explained that the subject of his paper covered so wide a field, that unless he confined himself to one department he was afraid he would be too discursive; and therefore he thought it best to confine his remarks to one section of industrial lighting. He had accordingly selected the subject of scientifically lighting a Lancashire cotton-mill by gas.

The author then threw upon the screen a picture showing how a factory interior was so constructed that a good scattered light, with freedom from glare, was obtained from the northern sky. The lighting was, he said, all that could be desired. When, however, they came to the question of artificial illumination, a very different tale must be told. Until the advent of the incandescent mantle, the artificial illumination of mills was very unscientific indeed; and he regretted to say that in some cases it still left much to be desired. Mr. Andrew, the General Manager of the Gas Department of the Oldham Corporation, recently took a census of the burners in the works of the mills in the town, and was surprised to find 44,946 flat-flame burners in use. When to these must be added a large number of carbon filament electric lamps, a very serious state of affairs was revealed. It would be seen that in these cases the operative worked under very trying conditions; for there was a great contrast between the ample illumination of the place during daylight and the inadequate and badly-arranged illumination when daylight failed. A series of tests carried out in eighteen mills showed an average maximum illumination of 32 and a minimum of 8·6 foot-candles with daylight, compared with 0·63 and 0·62 foot-candle artificial lighting with flat-flame gas-burners and 1·2 and 0·58 foot-candles with carbon filament electric lamps. He ventured to repeat a remark he made when giving evidence before the Committee on Factory Lighting at the Home Office—that both flat-flame gas-burners and carbon filament electric lamps ought to be prohibited in mills, except in very special cases. Unfortunately, any addition to the illumination in the old days meant very considerable extra cost, a multiplication of the light sources, and much more heat. The very low illumination just quoted was obtained by burning some 6 cubic feet of gas for each pair of looms, and to get what is now considered to be adequate illumination—viz., some 2 or 3 candle-feet—it would have required 20 to 30 cubic feet of gas for each pair of looms. This, of course, was prohibitive.

With the coming of the incandescent mantle, all this was changed, and the possibility of obtaining more light was easily demonstrated. The upright incandescents were first introduced, and these in turn are being rapidly replaced by inverted burners on pressure-gas systems. The author said he thought all would agree with him that it spoke well for the Lancashire manufacturer, was an object-lesson for many other industries, and a proof of the economy of efficient lighting, when they considered that the owners of many mills had altered their lighting methods three times during the last ten years, at very heavy capital charges; for it could be taken that the cost in each case had not been less than some 7s. 6d. a position, and there were many hundreds of positions in most mills. Some thousands of inverted incandescent burners are being installed yearly; and the Textile Lighting Company in Manchester, with which the author is connected, have been for several years fixing about 25,000 of these lights annually in mills alone. Luckily the saving in the gas bill has been very considerable, even after allowing for greatly improved illumination, owing to the improved methods of burning the gas. In many cases within the author's experience, the manufacturers had decided to keep at the same level the quantity of gas consumed, and had given the employees the advantage of a very great increase in illumination. They were getting in some cases as much as 6 to 8 candle-feet taken at the loom, instead of 0·63 candle-foot in the old days. Mr. Thorp said he need hardly tell his audience that it paid to do this, not only from the financial side, but from the knowledge that the operatives were more content; and this at the present time is a very important consideration. Many cases were known of weavers leaving one firm to go to another purely on account of the better illumination; and in one or two instances they had averted a strike only by hurrying-on the better lighting of a shed.

The author said it was a very difficult matter to obtain reliable data with respect to the increased output of work due to better lighting, as so many factors had to be taken into consideration. But in the best artificially-lighted mills of which he had knowledge, the weavers' wages for the ten weeks ending the 18th of December were £2498, compared with £2541 for a corresponding period ending the 9th of October—showing that, in spite of the dark weather, the turnover was equal to that in the light weather. When it was known that adequate scientific illumination could be obtained at a cost of 0·18 per cent. of the turnover, while the Insurance Act contribution came to 0·36 per cent., or twice the lighting cost, it was not surprising to learn that tens of thousands of incandescent gaslights were being yearly installed throughout Lancashire and Yorkshire.

Economy in lighting could not, however, the author pointed out, be judged solely by either the saving in the cost of the illuminant employed or even by the production of good work, as the human factor is, after all, the most important; and he expressed the opinion that a regulation should be laid down requiring that a certain number of foot-candles should be provided. But this, he said, would only go half-way to solve the problem. The illuminating engineer must be called in, and each case settled scientifically, so as to ensure not only the stipulated minimum illumination but its correct application. In the case of weaving, ample general illumination is necessary; and it is comparatively easy to provide it by having a large number of artificial light sources fixed some 6 ft. 6 in. high, furnished with suitable reflectors. With a good general light such as is produced by inverted incandescent burners, weavers' wages are found to be equal in December to those of July. Their labours as scientific illuminating engineers should be to provide an ample light in the very best possible manner, and so assist the human element to give of his or her best. If this was accomplished, they might rest assured that the mere pounds, shillings, and pence portion would automatically take care of itself, and they would have true economy with efficiency. This was the standpoint he invariably took and endeavoured to impress upon clients even more than that of economy in gas consumption. A knowledge of this and similar facts had, no doubt, caused the appointment by the Home Office of the Committee on Factory Lighting; and he trusted that their investigations would lead to the recommendation of conditions which would be advantageous to all.

Mr. Thorp went on to show that, in the hands of the illuminating engineer, incandescent gas lighting could be designed to give almost ideal conditions for all purposes. For general weaving, it could be applied very simply; but for other processes special arrangements must be designed. He then threw on to the screen two slides showing the character of the work the light is required to illuminate. He said he could give instances almost without number where efficient lighting had been accomplished and the lighting bill halved at the same time; but he thought it best to show why efficient lighting was economical, rather than quote figures which could be made to prove anything one desired. Probably all illuminating engineers took as a guide the list of rules for good lighting published in the "Illuminating Engineer" for December last; but he thought it would be advisable to add to them the three principles laid down by Mr. D. R. Wilson in his report on the illumination of factories in the annual report of the Chief Inspector of Factories for 1911*—viz.:

1.—The light should be adequate, having regard to the nature of the work.
2.—The light units should be so arranged as to cause no glare effect.
3.—The light units should be so arranged as to produce no troublesome shadows.

Mr. Thorp said he should like to add:

4.—The system of lighting should be such that light failure should be practically impossible while the machinery is in motion.
5.—The light should not be subject to avoidable rapid deterioration.

The illuminating engineer would occasionally be called upon to state his preference for a form of illumination; and he (Mr. Thorp) said he should like to state that incandescent gas lighting would be his best medium for obtaining efficiency with economy. All the before-mentioned rules could be easily met; and by a judicious selection of the various systems on the market almost any condition could be arranged for. Low-pressure inverted incandescent lighting was now so efficient that it could be adopted for all ordinary purposes. High-pressure lighting was still more so; and where power was available, it could be adopted with success. It dealt with the fourth rule, and was of great importance, as many accidents had occurred through the sudden failure of the light while machinery was in motion.

Mr. Thorp went on to point out that not only could gas be adapted to the various conditions arising, but that the question of shading, focussing, and directing the light in various ways could be efficiently dealt with. He showed on the screen a few forms of shields, reflectors, rise-and-fall and universal joint pendants, and anti-vibrators in general use. Coming to the places where coloured goods are manufactured, Mr. Thorp said incandescent gaslight was particularly useful, as the majority of shades of colour could be easily matched. Dr. Ives had employed incandescent gas as the light source in his colour-matching device, as it required very little variation by means of absorption screens to make the light similar to daylight. With regard to accidents in cotton mills, the author showed by figures and a diagram that, though there is a tendency for them to increase in the dark months, this is more noticeable in other trades where efficient lighting is not carried out.

In conclusion, Mr. Thorp said the question of how to approach his subject had been a difficult one, as there were so many different paths he could have taken. He trusted, however, he had been able to show that the character of the work in mills absolutely demands efficient lighting in order to be economical, and that the very fact that thousands of pounds are being spent annually on improving the lighting shows that employers recognize the necessity for proper illumination. He felt that the labours of the illuminating engineer are only just beginning to be realized; and if the

* See "JOURNAL," Vol. CXIX., p. 38.

subject is approached in a practical commercial as well as in a scientific manner, much good could be done. He trusted gas would be the medium employed; and if it had been able to hold its own in the hands of local plumbers and so-called lighting engineers, who did not even know the meaning of the term "foot-candles," much greater headway would be made with it in the hands of trained illuminating engineers.

Mr. L. GASTER, in proposing a vote of thanks, called attention to the fact that the economy of efficient lighting was gradually becoming more appreciated by the public, although many manufacturers had known of it for several years, but kept the information to themselves. By efficient illumination, not only was the human element better looked after, but the £ *s. d.* standpoint also. An industrial census carried out by the National Electric Light Association of America showed that 1 per cent. of spoilage represented no less than 150 million dollars per annum; and of this spoilage, 75 per cent. was attributed to bad light, and the remaining 25 per cent. could easily have been avoided if attended to properly. On the question of the different amount of work being turned out by different employees not being an absolute test of the efficiency of lighting, he quite agreed; but the point could be tested by comparing the work of the same employee carried out under good lighting conditions and under bad lighting conditions. The effect of a good lighting installation would be a very much reduced time in turning out the same quantity of work. In the ordinary course, to speak to a manufacturer of foot-candle measurements was useless, because he did not know anything about them; but if an instrument was placed in his hands which enabled him to test quickly the illumination for himself, one was in the position of being able to prove the case.

Mr. HAROLD E. BLOOR, seconding the vote of thanks, said that the generally increasing efficiency of lighting installations of an industrial character was a satisfactory sign of the times that good lighting was being recognized. He personally had been much struck with this change of attitude on the part of manufacturers, and had been trying to trace the origin of it. Only comparatively recently it had been assumed that, in a works where there was not a large amount of overtime, the lighting was of comparatively small importance—that was at a time when it was not realized that good lighting could be made to pay. Now, however, the general feeling seemed to have grown up that it did pay to have good lighting. He had heard as a reason for this growing tendency to regard good lighting as a necessity, that it was due to the various Acts of Parliament which affected factories; but in his opinion it was more likely to be due to the fact that manufacturers realized they were going to get more than it cost.

The CHAIRMAN put the vote of thanks to the meeting. In doing so, he said that his own house was lighted by gas, and so far he had resisted the temptation to substitute electricity for it. In the laboratory, although an electric supply was extremely useful, a gas supply was even more so. But one point he had found was a difficulty in regulating the gas supply to incandescent mantles. Sometimes one mantle would require gas pressure to be taken off in order to give a better light, although a diminution of the pressure would injuriously affect another burner; so that it was impossible, without special adjustment of each burner, to get the best light from both. He presumed that it was some minute variation in the size of the hole through which the gas issued. But there was another point which made him doubt whether it was altogether the size of the hole. Many people must have noticed that incandescent burners were sensitive to sound. He had one which he used a good deal, which was stimulated by a noise. If he rattled the fire irons or hissed, for instance, he got a very much better light than at other times. This was connected in some way with the character of the jet of gas issuing from the small orifice. The jet, under the action of sound, spread and broke up; and in some way this filled the mantle better than if it were left alone. Whether or not it would spread easily depended upon the exact finish of the aperture. The slightest nick across it would often make an entire difference in this respect. He had experimented a good deal on the subject of sensitive flames and smoky jets; and the slightest change in the external outlet of the orifice might make an immense difference in the whole behaviour of the jet which issued from it. From the fact that sound was favourable, he inferred that some spreading of the gas jet after it left the orifice was desirable; and it was possible that the unequal behaviour of different burners depended on some minute difference of this sort, and was a point of difference worthy of the attention of manufacturers.

Mr. FRANKLIN THORP briefly responded to the vote of thanks, and expressed the opinion that, even if his paper had done nothing more than draw the remarks which Lord Rayleigh had made, it would have done some good.

Mr. F. W. GOODENOUGH, in proposing a vote of thanks to the Chairman, and speaking on the question of burners, said that it was very desirable that the attention of the public as a whole should be drawn to the necessity of purchasing the best burners rather than being led away by cheapness. It was one of the curses of the electrical and gas industries that the public were so inclined to buy what was low priced, when, as a matter of fact, they were not buying what was cheap. He would like to say, in his official capacity, that if either the Editor or himself had had the chance of reading the proof of Mr. Thorp's paper before it was read (but which unfortunately was not the case), he would probably have been asked to take out his expressions of opinion as to the preference between gas and electricity, because the Executive Committee had been trying to keep the platform an impartial one, even though it was at a Gas Exhibition. Gas men were notoriously enthusiastic for their industry, and their enthusiasm would out; but what the Executive Committee had intended to do was to put before the public the general principles of lighting, heating, and ventilation, leaving to other times and other places the advocacy of their own particular form of illuminant and heating forces. He (Mr. Goodenough) was not in any way censuring Mr. Thorp, but only wished to make it clear to Lord Rayleigh and the public that the Executive Committee's endeavour was to keep the platform as independent as was possible under the circumstances.

Mr. JACQUES ABADY seconded the vote of thanks to the Chairman; and, in connection with Lord Rayleigh's remarks as to the susceptibility of incandescent gas-mantles to sound, he mentioned the case of an inn at Stockport over the door of which was an incandescent mantle. The joke of the place was to invite customers to throw a shilling on the counter, which had the curious result of putting the mantle out. This was repeated several times, and always produced the same effect. A further peculiarity was that no other coin would produce this effect.

The vote of thanks was put to the meeting, and carried with acclamation; and the proceedings terminated.

COOKERY HALL.

Crowds of people still continue to be attracted to the Cookery Hall and take considerable interest in the gas-cookery lectures given by various experts of the art.

On Monday last week, the platform was occupied by Mrs. Asser, who, seconded by Mr. Hecht, gave an excellent dissertation on the merits of food reform diet. Miss Williams, the Lady Adviser for the Gaslight and Coke Company, followed in the evening with a practical demonstration of a luncheon quickly prepared and cooked with the aid of a gas-cooker.

On Tuesday, Miss Barker, the Demonstrator for the Croydon Gas Company, proved a fluent and convincing lecturer on the merits of gas as a fuel. Later on, Mrs. Godfrey Sutcliffe, M.C.A., who holds many prize medals, and who is so well known in the gas profession that her lecture needs no comment, cooked a dinner, consisting of many dishes, in one hour. On Thursday, a Bridge Supper was the subject of Miss E. M. Dodd's lecture. She had travelled from Scotland, in order that that country should be represented. Formerly Principal of the Dundee School of Cookery, it is needless to say that her lectures were crowned with the success she deserved. Miss Margaret Menhinnick, another lady adviser for the Gaslight and Coke Company, gave two useful lectures on "Supper Dishes" and "Puddings for the Nursery," and received many thanks at the conclusion.

Miss Holland, L.C.A., on Saturday, the 11th inst., and again last Saturday, lectured in her well-known style to large audiences. Miss Holland is Chief Demonstrator for the Southgate Gas Company, who may be congratulated on having such an able demonstrator on their staff.

The Home Made Cake Competitions, for cakes baked in a gas-oven, brought a large number of entries. The cakes were displayed in the Cookery Hall for two or three days, and were so well cooked that it took the Judges a considerable time to select the prize winners.

POPULAR LECTURES.

THE GENTLEWOMAN IN HER KITCHEN.

Mlle. Claire de Pratz delivered an interesting lecture on this subject last Thursday evening. In it, she gave an insight into the domestic methods of France, her account of which greatly interested the ladies of whom the audience was largely composed. The practice so common in France (and especially in the large towns) of living in flats, has led to great concentration in the matter of space; and this, added to the fact that coal is dearer in France than in England, has naturally led to a considerably greater use of gas in French than in English kitchens. Indeed, every operation (including the weekly washing) seems to be carried out by the aid of a gas-stove, which, according to the lecturer, is considerably smaller than the average cooker used over here. The notoriety which the French have in respect of cooking is the more astonishing when it is remembered that there are no cookery classes of any description in France, though just recently a State cooking class has been opened—much to the disgust of the older school of French housewives. Sir John Cockburn took the chair at this lecture.

THE FRENCH HOSTESS AND HER ENGLISH SISTER.

In her second lecture, on Saturday, Mlle. Claire de Pratz explained the French salon (drawing-room), and its influence upon national life. At the conclusion, in answer to a question by Mr. F. W. Goodenough, she said that the price of gas in Paris is 20c. per cubic metre, which Mr. Goodenough said would come to about 5s. 8d. per 1000 cubic feet. Hot water radiators were also, she said, very popular. The radiators, however, were by no means as artistic as English ones.

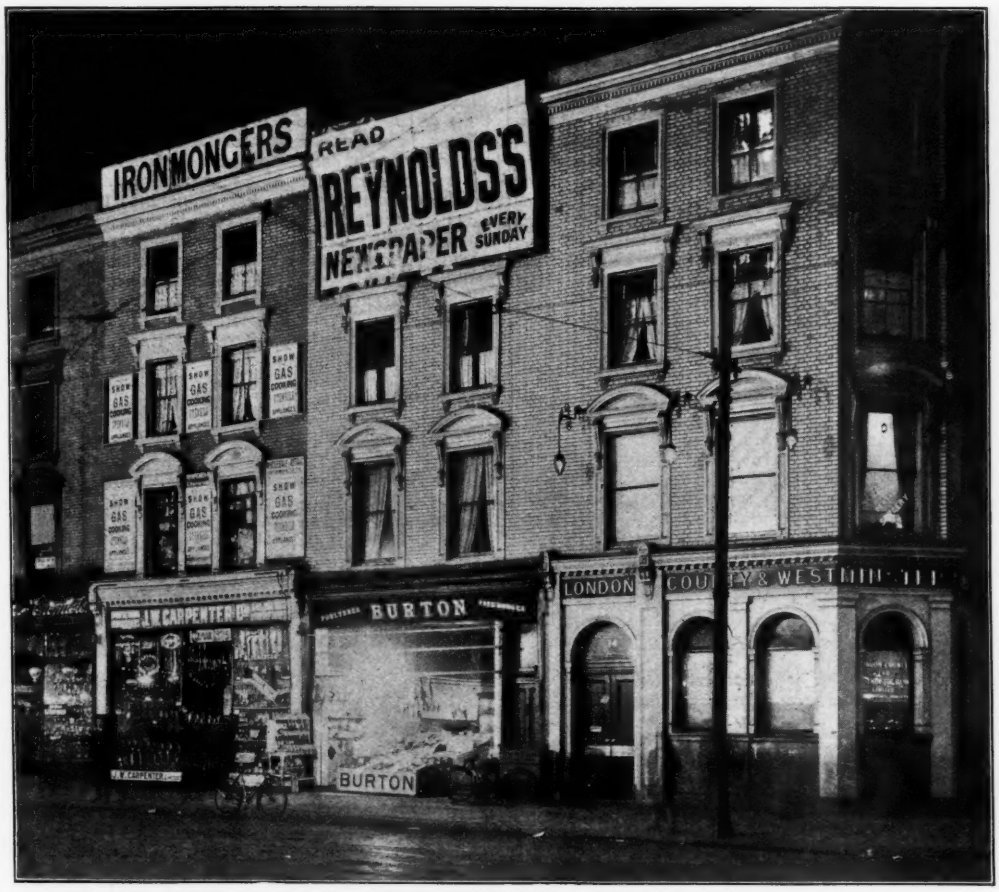


Photo by John H. Avery and Co.

THE ILLUMINATING AND DISTRIBUTING POWER OF THE KEITH HIGH-PRESSURE "SILICA" LAMPS SUSPENDED FROM THE TOWERS AND OVER THE FRONT OF THE EXHIBITION ENTRANCE.

[In this picture we have a remarkably fine "object-lesson." The photograph was taken from the Exhibition steps, after the shops (with one exception) were closed, and after traffic had practically ceased for the day. The excellent diffusion of the light from the lamps is seen by the good definition of the details of the fronts of the buildings opposite; and we can vouch for the fact that there has been no "touching-up" whatever of the photograph, though, of course, some of the clearness is lost in the reproduction and printing. Direct across the Uxbridge Road, the measurement from the Exhibition steps is 90 feet; and, from the Exhibition steps to the corner of the bank, the distance is 105 feet. The picture was taken from the point from which this measurement was made.]

JOINT MEETING OF ENGLISH AND SCOTTISH JUNIOR ASSOCIATIONS.

THERE have been several combined meetings of the English Junior Gas Associations, but in these unfortunately the members of similar Associations across the Border have been unable to take part. The holding of the National Gas Exhibition, however, offered inducement for a special effort for a gathering of members of all the six Junior Associations; and a meeting took place on Saturday, a special and most gratifying feature of which was the large number of members who had travelled long distances, in order to meet their *confrères* and inspect the Shepherd's Bush Exhibition. The fixture was a great success. Indeed, it could not have been otherwise, favoured as it was by a large and enthusiastic attendance, thoughtful and hospitable hosts, and glorious weather.

The programme necessitated an early start—alternative visits being arranged for the morning (to Fulham and Kensington), with a general assembly at the Fulham Gas-Works for lunch, and a similar muster at the exhibition later on for tea. Two parties of about forty each took part in the early visits; and by lunch time the numbers had been swelled to about a hundred, a total which was about doubled when tea-time arrived. Mr. Edward Allen (the President of the Institution of Gas Engineers) and Mr. Alexander Wilson, of Glasgow, gave practical proof of their interest in the Junior Association movement by spending the day with the party, and from all with whom they came in contact members received a cordial welcome, that will cause them to have pleasant memories of their visit to London.

The Scottish contingent was under the leadership of the President of the Western District Association (Mr. John Wilson, of Falkirk) and the Hon. Secretary (Mr. David Fulton, of Helensburgh). Unhappily, the President of the Eastern District (Mr. W. Geddes, of Granton) was not well enough to accompany the party. With the Manchester Junior Association were the President (Mr. W. L. Heald, of Preston) and the Hon. Secretary (Mr. J. Bridge, of Stretford); with the Midland Junior Association, the President (Mr. W. H. Johns, of Malvern) and the Hon. Secretary (Mr. W. J. Pickering, of Birmingham); with the Yorkshire Junior Association, the President (Mr. W. W. Atley, of Normanton) and the Hon. Secretary (Mr. Edward Garsed, of Kippax); and the London and Southern Junior Association were headed by their President (Mr. S. A. Carpenter, of Mill Hill) and Hon. Secretary (Mr. Ernest Scears, of Hampton Court). Mr. A. L. Holton (Manchester), Hon. Secretary of the Joint Council of the Associations, was also with the party. A word of thanks is due to the ladies who assisted by their presence in making the day a pleasant one for all concerned.

Harwood Terrace Stove and Meter Works.

On arrival at Fulham, the party who had selected this portion of the programme for the morning proceeded to the stove and meter depôt in Harwood Terrace, which is adjacent to the Fulham Gas-Works. Here, in the unavoidable absence of Mr. W. Fagan, the Manager of the Stove and Meter Department, they were taken in hand by Mr. F. S. Larkin, his Assistant.

The visitors were first shown the filthy condition in which some of the stoves are received from the district, and the method of cleaning them was fully explained. First of all they are put in furnaces, at a temperature of about 1500° Fahr., to burn off all grease, dirt, &c. They are then taken out, and either washed or cleaned by the sand-blast process. Close by these ovens are coppers in which the brass-work, &c., and the enamelled plates are cleaned by boiling off in strong acid solution. The Bower-Barff plant for oxidizing fittings, which has recently been installed at Harwood Terrace, proved an object of interest. This consists of

four blank-end retorts in a setting. There was seen in operation the sand-blast plant, comprising four cubicles in which either stoves or fittings may be cleaned. The plant is supplied with compressed air by two 35 H.P. gas-engines driving vertical compressors. Samples of the excellent work done were shown.

Next an inspection was made of the old stove stores and the new ones; special notice being taken of the facilities for the loading of vans from the loading bank. In the stove-erecting shop, much interest was evinced in the grinding and polishing machinery, and also in the japanning room and muffle—the finish of some of the articles displayed being greatly admired. The various methods employed in renovating stoves were explained and demonstrated; and in the stove fittings stores astonishment was manifested at the large number of spare parts which have to be kept for a depôt doing the amount of work that is carried out at Harwood Terrace. Attention was drawn to the artesian well; an outlet being opened to enable visitors to see for themselves the water that can be delivered by the action of compressed air at 450 feet below the surface.

The meter side of the works was subsequently visited, a beginning being made with the test-room, in which there are eight pairs of 10 cubic feet holders, and one 20 cubic feet holder. Work was also in progress here at the time of the inspection. Special attention was called to the holders erected at some distance from the plant by means of which the gas used for testing meters is employed again for testing stoves, instead of being blown away into the air, as is generally done. Several million cubic feet of gas have been saved by the adoption of this method during the time the works have been in operation. The meter-stores, paint shop, and tin shop were passed through; the quality of the paint work done meeting with general approbation. One coat only of the special enamel used is required to give a very satisfactory appearance to a meter.

At these works about 200 men are employed; and during the twelve months ending last June there were sent out from this depôt alone on to the district about 45,000 stoves and 80,000 meters. Of course, Harwood Terrace is only one depôt of the Gaslight and Coke Company's Stove and Meter Department. There are two others—a larger one at Haggerston, and a smaller one recently opened at Stratford, in order to cope with the extension of the Company's business in that area.

The Fulham Gas-Works.

A move was then made to the Fulham Works of the Gaslight and Coke Company, over which the visitors were shown by the Engineer (Mr. A. H. Solomon), the Assistant Engineer (Mr. E. G. Stewart), and the Works Foreman (Mr. W. Scadding).

These works have a private railway siding, as well as a connection with the river by means of a short creek opening into a spacious dock. The area of the works proper is about 26 acres; but land adjoining is used as allotment gardens, men's recreation ground, workmen's cottages, and a tip. The capacity is 10 million cubic feet of gas per day—7½ million of coal gas and 2½ million feet of carburetted water gas—with an additional 2 million feet in two hand-operated retort-houses which are not likely to be again used previous to reconstruction. The retort-houses form two solid blocks of buildings, and between them are the covered coal-stores, the flat roofs of which form an overhead platform upon which are laid rails, on which run hand-propelled hopper-trucks for the transport of the coal from the crane bunkers to the houses and covered stores. On the overhead platform, and abutting on the dock sides, are two cranes and a hoist, which all operate Hone 1-ton grabs, and discharge into bunkers which feed the breakers, the outdoor storage plant, or the trucks for transport to the houses or stores. The unloading capacity is 1200 tons per day, and the capacity of the covered storage 8000 tons.

One of the features which were pointed out on the works is a Dodge coal storage and reloading plant. In this, a scraper conveyor feeds the small side-tip waggons, which run on temporary rails laid on the surface of the coal-heap. The heap is in the form of a third of a circle 230 feet radius, and 12 ft. 6 in. thick. The reloading is done by means of a pushplate conveyor carried on a radial boom 234 feet long, which lies along the base of the heap, and can be swung round as the heap is used up. It then passes up an incline, and delivers into the trucks on the overhead railway. Power is derived from a 40 I.H.P. steam-engine. The plant is over 20 years old, and is believed to be the only one in the country. It is stated to be quite successful, and can transport either way at the rate of 40 tons per hour. The finished heap holds 16,500 tons.

There are two houses filled with inclined retorts, each containing eighteen beds of eight retorts, of 24 in. by 14 in. section. The charge is about 8 cwt.; and the make of each house is just over 2 million cubic feet per day. De Brouwer conveyors take the coke outside, and up an incline to storage bunkers, from which it is delivered into carts, trucks, or motor vans—all power being supplied by gas-engines. The third house which is in regular use has in it twenty beds of horizontal retorts, ten in a bed, five tiers high. The retorts are 23 in. by 16 in. section, and are operated by a Fiddes-Aldridge simultaneous stoking machine, in which the visitors were much interested. The machine takes its coal for each charge automatically from overhead bunkers as it travels. Each retort occupies about a minute, and the charge is approximately 10 cwt. The make of this house is about 3¼ million cubic feet. The coke is treated in the same manner as in the case of the other houses; and the whole of the plant is operated electrically. The carburetted water-gas plant (which has been quite recently reconstructed) is built on the twin generator principle, and consists of two sets each of 1¼ million cubic feet capacity. The generators are on a stage floor, so that the clinker is shot into a cellar, and removed by hydraulic lift. Coke is supplied by a lift direct from the cellar of one of the retort-houses which adjoins; and for the regulation of the working a weighbridge and recording and indicating pyrometers are provided.

The exhauster-house is a fine building, and contains eight exhausters driven by vertical steam-engines, two of which are used for pumping Beckton gas, and are in connection with the 36-inch high-pressure mains. In two small towers at the outlet of the condensers, the gas is washed with carburetted water-gas tar for naphthalene extraction. The tar and ammoniacal and cyanogen liquors are sent by barge to the Company's products works at Beckton. There are four sections of purifiers—three for coal gas, and one for carburetted water gas. Each section consists of four working boxes filled with oxide, and two checks filled with Weldon mud. The oxide is worked up to 70 per cent. sulphur, and is then sent to Beckton.

The total storage capacity is about 10 million cubic feet. There are six holders, one of 250,000 cubic feet capacity having been built about 1824. This is now used as a relief holder for the carburetted water-gas plant; while two others are usually reserved for storing Beckton gas. Leaving out of account the relief holder, the capacities range from 1¾ to 2½ million cubic feet. A good deal of attention was paid to the (compared with more modern practice) massive character of some of the guide-framing. There is plant for dealing with naphthalene by means of paraffin vapour; and the station is provided with excellent workshops, equipped with machine-tools. Interest was shown in the electrically-driven breeze-washing plant, which deals with the ash-pan rubbish at the rate of 6 tons per hour—separating and grading the clinker and coke.

Imperial College of Science and Technology.

The party who went to the Imperial College of Science and Technology visited the department of chemical technology. Unfortunately, Dr. W. A. Bone, the Professor, was unable to be there to meet them; but his place was ably filled by Mr. G. I. Finch (Demonstrator), who took great pains to explain objects of more immediate interest to the members. For instance, the Bone and Wheeler gas-analysis apparatus was thoroughly explained, and made most interesting. He also showed a method of estimating volatile matter in coal, which consisted of heating a closed clay crucible in a muffle furnace, for a stated period, until no more gases were given off. Mr. Finch remarked that in this way he obtained very concordant results. He showed some samples of coke that had been withdrawn from the crucible, and some of the visitors remarked that they appeared to have a central core, which might lead one to believe that it would be possible to get more gas from them. An explanation was then given of the Mahler bomb calorimeter for the estimation of the calorific value of fuels—more especially coal. Mr. Finch said he was now experimenting on another form of calorimeter, in which the heat was measured by means of a millivolt meter calibrated in heat units, so that the result could be read directly from the instrument. It was pointed out that at the present time this was merely in the experimental stage, and several little alterations would have to be carried out to make it perfect. In addition to these, there was another very elaborate apparatus installed for the investigation of explosion pressures, more particularly for dealing with internal combustion engines. It was stated that it was perfectly safe to explode mixtures of oxygen and hydrogen in this apparatus when compressed to (say) 300 atmospheres.

Mr. Finch described the college to the visitors, and drew attention to the fact that at present everything is more or less temporary. He then took them to the building in course of construction, where a much more capacious suite of apartments will be at the disposal of the department. To all appearance, the new buildings when finished will be most suitable for the purpose for which they are intended. As little as possible is being spent upon outside ornamentation work, so as to reserve as much as practicable for expending on apparatus, and so on.

A Luncheon.

A busy and instructive morning having now come to a close, the visitors were directed to the men's Institute on the works, where the party of about a hundred sat down, at the invitation of the Gaslight and Coke Company, to lunch—Mr. Solomon presiding. In addition to Mr. Edward Allen and Mr. Alexander Wilson, those present included Mr. J. H. Hill, of York. The generous hospitality of the Company to so large a number of guests was heartily acknowledged.

Mr. S. A. Carpenter, on behalf of the Council of the London and Southern Junior Association, expressed gratification at the dimensions of the gathering—and particularly at the presence of so many friends from Scotland.

Mr. John Wilson proposed a hearty vote of thanks to the Directors of the Gaslight and Coke Company, coupled with the name of Mr. Solomon. He said it did good to all of them to be present at a gathering of this character; and it would be an advantage if they could manage to hold combined meetings more often, to exchange views and meet one another in a social way. ["Hear, hear."] He thought he voiced the opinion of all when he remarked that the works they had seen that day were evidence of the progressive policy of the Gaslight and Coke Company; and the gathering that day on the invitation of

the Directors was still further evidence of their progressiveness. The interest they took in the gas profession as a whole was shown by them giving the juniors the privilege of going over their works and learning all about them. Perhaps, coming from Scotland, it seemed somewhat strange that he should be called upon to propose this vote of thanks to the Directors; but, as a matter of fact, he was born (he had been told) under the shadow of one of the Gaslight and Coke Company's holders at the Nine Elms Gas-Works. Mr. Solomon and his assistants had shown them the various processes and explained everything to them, and so the visit had been highly instructive.

Mr. W. W. Atley, in seconding, remarked that they had already been amply repaid for the long distances they had travelled. He had much enjoyed the tour of the works.

Mr. Solomon, acknowledging the heartily accorded vote of thanks, said the Directors were only too pleased to give opportunities to anyone and everyone to view any part of the Company's plant. During the past ten years, he had had the honour of showing a good many parties round the works—especially at Beckton; and he often found he learnt a lot himself in doing so. He was particularly pleased to see ladies present; for the social aspect of such gatherings was important. He referred to the Dodge coal storage plant, and said that when it was first put up (about 1891) they had a piling conveyor 70 feet high. This, however, they had to take down for various reasons. Now, they generally stored their coal 15 feet deep, and seldom experienced any heat in the heap. In the winter the works carbonized about 3000 tons of coal a week, and they stored up to 20,000 tons. He was glad that Mr. Edward Allen and Mr. Alexander Wilson had shown their interest in the juniors by being present.

Gathering at the Gas Exhibition.—And Tea.

After lunch those who were not required to attend the Joint Council meeting which had been arranged for, proceeded to Shepherd's Bush, where, in the reception room at the exhibition, there was later on a general assembly. By this time the numbers had been largely swelled; and, as a matter of fact, a party of 200 sat down to tea, which was served in the banqueting room. Mr. F. W. Goodenough presided, and he was supported by Mr. Allen, Mr. Alexander Wilson, and Mr. R. G. Shadbolt. After tea, some interesting and appropriate remarks were made, which it will be useful to record, as probably no one among all those present heard everything that was said in different parts of the room.

Mr. F. W. Goodenough said that, on behalf of the Executive Committee, he wished to welcome the members and friends, and to express the hope that they would thoroughly enjoy the visit to the exhibition—finding not too much to criticize, and a good deal to interest them. There was just one point to which he would like to draw their attention, and that was the display of ventilating gas-lights which they would notice in several of the big halls of the exhibition, and which were proving of very great utility. The efficiency of these lights in accomplishing the purpose for which they were intended was a matter to be borne in mind. One of the first points kept in view in the arranging of the exhibition was to provide plenty of air space and room for the people; but he thought they would agree with him that this provision had not in any way been overdone, and that there was just now very little room to spare. This was extremely satisfactory; and they would be glad to know this week there had been about 70 per cent. advance in the attendance each day, as compared with the corresponding days of the week preceding. On Thursday, which was the Patrons' Day, and subject to special arrangements for admission up to 5 o'clock, the attendance beat the previous Saturday; and he believed the present Saturday would beat every other day by a long way. He was glad to see so large a gathering at tea.

Mr. S. A. Carpenter remarked that on the north door of St. Paul's Cathedral, there was an inscription to Wren which read: "If you would see his monument look around you." In the same way, this exhibition was a monument to the energy and organizing ability of Mr. Goodenough, who, as Chairman of the Executive Committee, was responsible for the display as they saw it that day. Of the difficulties which had to be overcome an outsider could have no conception. Labour troubles, to mention one thing only, were continually cropping up. Gas exhibitions in themselves were not new things. In one shape or another, they were all quite familiar with them; but it had been left for Mr. Goodenough to strike a new note, as it were. Without in any way disparaging other exhibitions, they were bound to admit that there was something monotonous in seeing stall after stall showing similar apparatus. Here, however, there was a display which was interesting, bright, and educational at one and the same time. There was doubt in some quarters as to whether a gas exhibition would be sufficiently interesting in itself to draw the general public; but this doubt was quickly set at rest, for they had come in their thousands. If he might paraphrase a remark Mr. Goodenough made a few weeks ago, he would say: "People are liking this sort of thing, and finding it the sort of thing they like." Electrical friends were watching the exhibition closely; but it was in no sense intended to belittle or disparage electricity. It was to educate the public in the multifarious uses of gas. There was a tendency at one time for gas people to stand in the background, and leave the man in the street to find out for himself the benefits of gas, if he ever cared to do so. This time had passed; and the National Gas Exhibition typified the spirit which obtained at the present day.

Mr. W. L. Heald, in proposing a hearty vote of thanks to Mr. Goodenough for presiding, said Mr. Goodenough was in the South. He personally, with many more who were present that afternoon, was in the North; and he could say with every truth that they in the North envied the Southerners for possessing such a man to help them along in their endeavours to promote the welfare of the gas industry. They were indebted to Mr. Goodenough for being with them and welcoming them to the exhibition. He was Chairman of the Executive Committee, and in this capacity had been to a great extent responsible for the success of the exhibition. As juniors, too, he thought they were all—not only the Southerners, but those in the North as well—indebted to Mr. Goodenough for what he had done for them. A short time ago, he gave the Southern Association an address; and no doubt they would look to him again in the future. Though nominally he spoke to the Southern Juniors, through the Technical Press they were all able to take advantage of what he said.

Mr. A. L. Holton, who seconded, referred to the final scene in one of the University pageants, where the characters depicting the various ages came on one after another, and each handed a lighted torch to the one who followed. Last of all the torch was taken up by a boy. Applying this, it seemed to him to be the duty of all those who were at the head of the profession to hand their information on to those following, in order that satisfactory progress might be made.

The vote having been put and carried with loud applause,

Mr. Goodenough acknowledged it, and remarked that it was always a pleasure to him to come among the juniors, because he was only a junior himself. He was only a boy still, and hoped to remain one for some time to come. Mr. Heald had referred to him as being a Southerner. Well, he happened to be placed in the South; but he came from the West, and he hoped that, in connection with the British Commercial Gas Association, he might claim to be of the United Kingdom, and not merely of the South. ["Hear, hear."] The British Commercial Gas Association was a truly British and National Institution, and he believed that, in the work they were doing in connection with it, they were working for every undertaking in the country, from John o' Groat's to Land's End. He therefore felt he was entitled to say that he had a share in the labours of the gas industry all over the country.

Mr. Edward Allen remarked that it was a great pleasure to ask them all to join with him in wishing "Prosperity to the Junior Gas Associations." He need hardly say that, representing the Institution of Gas Engineers, it was a great satisfaction to him to be present. The Institution had for a long time taken a deep interest in the Junior Associations of the country. They were getting very proud of their juniors, and to-day they fully recognized the strength of the Junior Associations—their vitality, enterprise, and initiative, in gathering together in such large numbers. They had come from all parts of England and Scotland to demonstrate their interest in this great exhibition; and speaking on behalf of the exhibition authorities and Committee, he wished to assure them all that the interest they had shown in coming there was very highly appreciated. They specially welcomed the ladies. The Junior Gas Association of each district was but a grade. The present *personnel* of the Associations they esteemed very highly; but in a few years the *personnel* that he saw around him would be the *personnel* of the Institution of Gas Engineers. They wanted the juniors to realize that they were merely passing through one grade, and proceeding to a higher grade. Therefore the seniors were most anxious that the juniors should in every possible way qualify themselves for taking positions of distinction in the first class. In such visits as they had paid that day to Fulham and the exhibition, they were helping to fully qualify themselves to serve the great gas industry through the many years which he hoped lay before them. "Please realize and understand," he concluded, "the Institution take the very greatest possible interest in your Associations, in the papers you read, and in the meetings you hold from time to time; and we wish you very great success." [Applause.]

Mr. Alexander Wilson said he had been asked to second Mr. Allen's good wishes for the juniors, and he did so with the greatest goodwill. He had spent a great portion of his life in the South, and had been for a long time in the North. The coming of the Junior Associations, he thought, brought a new help to the gas industry. The older Associations wanted something to spur them on, and they got it from the juniors. He was sure the work done by the Junior Associations had not only helped to lend zest to the work of the older Associations, but had assisted them in a great many other ways. They looked for a great deal more help from the juniors in the future, because, as Mr. Allen had said, they were very soon to be the seniors. He hoped it would be a long time before this came about. [Laughter.] He was very glad to be with them at Fulham that morning; and he felt that they were all much indebted to the Gaslight and Coke Company for their reception and the kind way in which they had treated the juniors. Meetings such as this of juniors from all parts of the kingdom were bound to have a great effect on the industry, and he hoped there would be many more of them. He could echo what Mr. Allen had said—that the Senior Associations wished the utmost success to the Junior Associations.

Mr. W. H. Johns said the honour had fallen to him of returning thanks for the kind wishes that had been expressed by Mr. Allen, the President of the Institution of Gas Engineers, and Mr. Wilson, of Glasgow. He felt that he had no light task to perform, as this was a very important occasion. The juniors fully appreciated the reception given them, which had been of a most cordial character. They had Mr. Allen's assurance that the seniors were at the back of them; and they realized that in the past, without their support, they would have been helpless. The Junior Associations had already reached a very high position in the gas industry, and he thought they had still more work to do. Some little discussion had recently arisen with regard to affiliation; and Mr. Allen and Mr. Wilson, from their remarks that evening, seemed inclined to have their sympathies in this direction. Therefore he hoped they would hear more of the matter in the immediate future. As no doubt most of those present were aware, he had, in his recent Presidential Address to the Midland Junior Association, referred to this topic, and some might have thought he was a little out of date, owing to the fact that the Institution of Gas Engineers had replied in the negative to the suggestion of affiliation. Really he was quite up to date, and he put these remarks into his address so as to ask once again, from the presidential chair, for the support of the main Institution, by the aid of which he thought they could do even more work than they had done in the past. He hoped, especially after the conference that day, their plea would receive further consideration. He really thought they could look forward to this, and he trusted the matter would then meet with more success than last time. There was no doubt that the junior of to-day would be the senior of to-morrow. Take his own case, yesterday he was a junior, and to-day he was a senior; but though now a senior, he would remain loyal to the juniors. The juniors believed they ought to be affiliated, and that by being affiliated they could benefit the industry at large. He

would like to thank Mr. Allen and Mr. Wilson personally for the very kind remarks they had made, and also for favouring them with their presence; and in doing this he felt sure he was voicing the feelings of all present.

The party then rose from the tables, and scattered themselves among the huge crowds of people in the exhibition, where the time available was spent in inspecting the many objects of interest.

DIARY OF EVENTS.

NATIONAL GAS CONGRESS AND EXHIBITION, October, 1913.

DAILY ATTRACTIONS.

String Band of the Scots Guards, 3 to 4.30 and 6 to 7.30, in the Domestic Section Hall.

Military Band, 8 to 9.45, in the Domestic Section Hall.

Music in the Tea Room, 4 to 5.

Cookery Lecture and Demonstration at 4 and 7.30 (except 7.30 on Oct. 31).

Preliminary Cookery Competitions up to Oct. 25 [inclusive] daily at 2.30 and 6 (except Oct. 22 and 23).

Tuesday, Oct. 21.

Annual Meeting and Conference of the British Commercial Gas Association at the City Guildhall.

8 p.m.—Popular Lecture: "Practical Hints on the Use of Gas in Factory and Workshop." By W. H. Y. Webber, Esq.

Wednesday, Oct. 22.

Annual Meeting and Conference of the British Commercial Gas Association at the Exhibition.

11 a.m.—**Judging of Home Cookery Competitions.**

Meeting of the Executive of the Sulphate of Ammonia Committee.

Private Dinner of the Sulphate of Ammonia Committee.

8 p.m.—Popular Lecture: "The Origin and History of Artificial Lighting and Heating." By Edward Lovett, Esq.

Thursday, Oct. 23.

Imperial and International Day.

10.30 a.m.—**International Meeting of Sulphate of Ammonia Makers in the Conference Room of No. 5 Hall.**

11 a.m.—**Judging of Home Cookery Competitions.**

8 p.m.—Popular Lecture: "Hints to Gas Consumers on How to Get Value for Money." By John Young, Esq.

Friday, Oct. 24.

2 p.m.—**Conference on the Economics of the Home (continued on Saturday, Oct. 25).**

Papers to be read:—

"Domestic Service as a Career for Educated Women." By Mrs. M. A. Cloudesley Brereton.

"Fuel and Light in the Working Man's Budget." By Mrs. Margaret M'Killop.

"Coal Gas as a Fuel for Domestic Purposes." By F. W. Goodenough, Esq.

"The Wife as Bursar." By Miss Mabel Atkinson.

8 p.m.—Popular Lecture: "Hints to Gas Consumers on How to Get Value for Money." By John Young, Esq.

Saturday, Oct. 25.

11.30 a.m.—**Conference on the Economics of the Home (continued from Friday, Oct. 24).**

8 p.m.—Popular Lecture: "A Pennyworth of Gas." By Dr. C. W. Saleeby.

Monday, Oct. 27.

11 a.m.—**Judging of Home Cookery Competitions.**

6 p.m.—**Final Cookery Competition for Housewives.**

8 p.m.—Popular Lecture: "The Use and Abuse of Light." By Leon Gaster, Esq.

Tuesday, Oct. 28.

11 a.m.—**Conference of Employers.**

Papers to be read:—

"Co-Partnership as a Means of Increasing the Prosperity of both Capital and Labour." By Aneurin Williams, Esq.

"The Relation of Science and Industry." By Surgeon-General Sir Alfred Keogh.

"Co-Operation between the School and the Employer." By Cloudesley Brereton, Esq., L. ès L. Paris, and D. Milne Watson, Esq.

"Natural Law in the Commercial World." By A. F. Sheldon, Esq.

2.30 p.m.—**Final Cookery Competition for Territorials (A and B).**

6 p.m.—**Final Cookery Competition for School Children.**

8 p.m.—Popular Lecture; "Practical Hints on the Use of Gas in Factory and Workshop." By W. H. Y. Webber, Esq.

Wednesday, Oct. 29.

11 a.m.—**Conference of Manufacturers.**

Papers to be read:—

"The Lighting, Heating, and Ventilation of Factories and Workshops." By Professor Vivian B. Lewes.

"Gas as a Fuel for Industrial Purposes." By Professor W. A. Bone.

"The Economic Value of Adequate Illumination." By Leon Gaster, Esq.

"The Matching of Colours by Artificial Light." By T. Thorne Baker, Esq.

2.30 p.m.—**Final Cookery Competitions for Boy Scouts, Girl Scouts, and Church Lads.**

6 p.m.—**Final Cookery Competitions for Sea Scouts and Territorial Nurses.**

8 p.m.—Popular Lecture: "Practical Hints on the Use of Gas in Factory and Workshop." By W. H. Y. Webber, Esq.

Thursday, Oct. 30.

2.30 p.m.—**Final Cookery Competition for Cook-Generals.**

8 p.m.—Popular Lecture: "The Silent Servant." By Miss Constance Williams.

Friday, Oct. 31.

6 p.m.—**Presentation of Prizes to Winners in Cookery Competitions by the Lady Mayoress of London.**

8 p.m.—Popular Lecture: "A Pennyworth of Gas." By Dr. C. W. Saleeby.

Saturday, Nov. 1.

8 p.m.—Popular Lecture: "Construction, Operation, Testing, and Reading of a Gas-Meter." By W. H. Y. Webber, Esq.

The death occurred on Sunday, the 12th inst., of Mr. James Stuart, formerly Professor of Applied Mechanics at Cambridge—a position he resigned in 1889. A few years ago he figured prominently in political and municipal affairs in London, being a member of the London County Council and also of Parliament. He was in his seventy-first year.

Writing in the "Electric Railways Journal" [Vol. XLI., p. 151], Herr F. Weiss compares zinc chloride with coal-tar creosote for preserving cross-ties. A great many preservatives have been tested for cross-ties, but zinc chloride and coal-tar creosote are far more extensively used than any others. The most noteworthy points are: (1) Zinc chloride and coal-tar creosote, when used under normal conditions, are both effective preservatives, and there is little to choose between them as to the annual charges. (2) Creosoted ties generally cost initially more than Burnettized ties; the cost of treatment being two to three times as much. (3) Creosoted ties last, on an average, longer in a track than Burnettized ties, and hence require less frequent renewals and changes in the road-bed. (4) If creosote advances appreciably in price, the probable result will be that more ties will be treated with zinc chloride.

PERSONAL.

THE MELBOURNE APPOINTMENT.

We learn from the London Agents of the Melbourne Gas Company (Messrs. John Terry and Co.), that Mr. J. N. Reeson, the Engineer-in-Charge at the Beckton station of the Gaslight and Coke Company, has been selected by the Directors to fill the position of Engineer, in succession to Mr. P. C. Holmes Hunt, for which applications were invited in the "Journal" for Sept. 9. Mr. Reeson served his articles under Mr. F. Beale at Beckton; and on the completion of his term he was appointed Assistant-Engineer there. He then occupied successively the positions of Junior and Senior Assistant, until he was made Deputy-Engineer under Mr. T. Goulden, the Chief Engineer at Beckton. Mr. H. Iago was appointed to succeed Mr. Goulden on his promotion to the Chief Engineership of the Company in 1902, and Mr. Reeson was transferred to St. Pancras at the latter part of 1903, in succession to Mr. Lacey. Two years later he was placed in charge of the Shoreditch works; and in April, 1906, he returned to Beckton as Chief Engineer, upon the appointment of Mr. Iago as Manager of the St. Pancras, Shoreditch, and Haggerston stations. We congratulate him on his selection for the important position he will have to fill, and cordially wish him success in the discharge of the duties appertaining to it.

Out of seven candidates, Mr. Mackay, of Kilkee, has been appointed, by the Kenmare District Council, Engineer in connection with the town's new water scheme.

At a recent meeting of the Directors of the Pittenweem Gas Company, a letter was submitted from Mr. David Stevens, resigning his position as Gas Manager, which he has occupied during the past forty years. The Directors accepted the resignation (which takes effect on the 12th of December next) with regret, and agreed to record in their minutes their appreciation of the long and faithful service that had been rendered to the Company by Mr. Stevens.

On Monday last week, Mr. George H. Elliott, who has for thirteen years been an assistant at the Hull station of the British Gaslight Company, was presented by the officials with a case of cutlery, a pair of solid silver dogs, and a small illumination framed in oak, as a testimony of their regard, on his leaving the Company's service to take up the duties of an appointment he has obtained at Nuneaton. Mr. John Young, the Engineer and Manager, made the presentation, and paid many tributes to the qualities of the recipient, which were endorsed by Mr. A. Allan, the Chief Assistant. The gifts were suitably acknowledged by Mr. Elliott.

A pleasing ceremony took place last Wednesday night in Birmingham, when a presentation was made to Mr. W. H. Johns, who has given up the position of Superintendent at the Saltley Gas-Works to take up his new appointment of Gas and Electrical Engineer to the Malvern Urban District Council. The gift was in the form of a silver salver and tea service, which had been subscribed for by the staff and foremen of the Birmingham Corporation Gas Department. Mr. W. Chaney (the Engineer of the Saltley works) made the presentation, and wished Mr. Johns every success in his new sphere. While regretting that he was leaving them, he expressed the opinion that it was a right step to take, to get full control of a gas-works. He said he appreciated the services Mr. Johns had rendered, and was personally sorry to lose him at a very busy time. Mr. Chaney was supported by remarks from Mr. R. S. Hilton (the Secretary and General Manager of the Gas Department), Dr. W. B. Davidson (the Engineer of the Nechells works), and Mr. E. W. Smith (the Chief Chemist). Mr. Johns, in reply, thanked them all for their kindly send-off, and also for the very nice present they had given him. As President of the Midland Junior Gas Association, Mr. Johns will have at hand a ready means for keeping in touch with many of his old friends.

OBITUARY.

THOMAS EBENEZER PYE.

We regret to record the death, on Wednesday morning last, of Mr. Thomas Ebenezer Pye, the Engineer and Manager of the Chichester Gas Company. Deceased had been admitted into a London hospital for surgical treatment, and his condition became so critical early in the past week that Mrs. Pye and the family were summoned. Unfortunately he succumbed.

Mr. Pye was the son of Mr. James Pye, the Secretary of the Chester United Gas Company, of which his brother (Mr. Fred. A. Pye) is now Secretary and General Manager; and for seven years he was attached to the staff of the Company, under Mr. Fletcher W. Stevenson. In 1886 he left Chester to take the supervision of four districts of the Commercial Gas Company, and held the position till 1891, when he left to become Assistant to Mr. William Belton at Shrewsbury. After being abroad for a short time, he obtained the appointment of Engineer to the Sandwich Gas Company. Early in 1905, he was selected as the successor to Mr. R. S. Church as Engineer and Manager of the Chichester Gas Company; and under his supervision, the works were reconstructed. He managed the business of the Company with much vigour, especially in competition with the electric light. His efforts in this direction not only secured for him the approbation of the Directors, but led to his selection to give evidence in opposition to projects for introducing electricity—notably at Banbridge and Dromore early this year. While assiduous in his endeavours to promote the success of the Company, he was not unmindful of the interests of the workmen, among whom, as with the citizens generally, he was held in great respect. He was an active man, and will be greatly missed in Chichester.

Mr. Pye wrote extensively on gas subjects. In 1892-3, he contributed to the "Journal" a series of articles on "The Manufacture, Purification, &c., of Coal Gas;" and the volumes for the past twelve years contain others on a great variety of topics. He also produced several pamphlets, and delivered lectures on gas.

Mr. Pye was a Fellow of the Chemical Society, and an Associate member of the Institution of Mechanical Engineers. He joined the Southern District Association of Gas Engineers and Managers in 1903, when he was at Sandwich, and at the meeting in November, 1908, he read a paper on "Advertising in Relation to Gas Supply."

Deceased leaves a widow, two sons (one of whom is with the South Metropolitan Gas Company), and two daughters.

Last Tuesday, Mr. C. Wooldridge, who had been Secretary of the Winchester Water and Gas Company for forty-seven years, died at his residence at Shawford. Deceased was in his eighty-second year.

We regret to have to record the death on Sunday, the 12th inst., at the age of 65, after only a short illness, of Mr. Ludwig Heinrich Paul Rudolph, the Assistant Engineer of the Outdoor Department of the Imperial Continental Gas Association's works at Berlin. Mr. Paul Rudolph entered the Association's service in July, 1891, when the Lichterfelde Gas-Works, of which he was then Manager, were purchased by the Association. He possessed a large circle of acquaintances among the various suburban authorities; and his knowledge and judgment were much appreciated by his chiefs in London and Berlin. During the last few years Mr. Rudolph had been in charge of the "Gas Sales Department;" and the energy and activity which he displayed in propaganda work contributed greatly to the success of this branch of the Association's business.

THE LATE MR. DANIEL MACFIE.

The gas industry is the poorer by the death, which happened under tragically sudden circumstances, in Princes Street, Edinburgh, last Thursday afternoon, of Mr. Daniel Macfie, the well-known gas consultant and engineer. He had attended earlier in the afternoon a meeting of the Edinburgh Merchant Company; and he was subsequently present at a Committee meeting. It was noticeable at both these gatherings that he was in his customary good health, and in high spirits, and that there was no premonition that his end was so near. Shortly after five o'clock, while walking along Princes Street in the company of Mr. Drummond, the interim Secretary of the Company, Mr. Macfie, near the Old Waverley Hotel, was seen to fall to the pavement. Medical aid was immediately forthcoming, and with all possible speed he was conveyed to the Royal Infirmary, where, however, life was pronounced to be extinct. Later in the day the remains were taken to his residence at St. Alban's Road.

Mr. Macfie led a singularly busy life, and matters connected with the gas industry claimed a large share of his business and professional interest. He was a native of Lanarkshire, and started work as an ironmonger with the late Mr. R. A. Paton, of Hamilton. He afterwards went as traveller to the firm of P. & W. MacLellan, of Glasgow, with whom he remained until he moved to Edinburgh as representative of Messrs. T. D. Campbell and Co., in Picardy Place. On leaving their service, he was assumed as a partner of the firm of Messrs. James Milne and Son, of Milton House Works, Abbey Hill, then a private concern. He took up his residence in London in 1882 as Manager of the London branch of the business then known as Milne, Sons, and Macfie. Some four years afterwards, on the death of Mr. John Milne, the principal of the firm of James Milne and Son, of Edinburgh, Mr. Macfie returned to the Scottish Capital, where, as full partner, he took over the commercial management of the concern. In 1892, when the business was converted into a joint-stock company, he was appointed Managing-Director. This arrangement lasted until 1907, when, by agreement, he left the firm and commenced business on his own account as a gas engineer, and in this capacity he was the agent of several well-known firms.

Mr. Macfie was a regular attendant at the various meetings of the different Gas Managers' Associations in Scotland. He was in great request as a contributor to the discussions at their gatherings, and he displayed sustained interest in their proceedings. He was one of the early members of the Waverley Association of Gas Managers, at the gatherings of which he was ever a welcome guest and an honoured figure. To the young men of the gas profession he set a high ideal of professional status; and his advice

was that they should always endeavour to become thoroughly acquainted with the technical and scientific side of their business. Among the Seniors of the gas profession, Mr. Macfie was held in universal regard; while among the Juniors the feeling was more akin to one of deep-seated and enduring respect.

Apart from his professional work, Mr. Macfie was a man of outstanding ability and literary taste. He wielded a ready and facile pen; and as the composer of light topical pieces he was well known in a wide circle. As a member and office bearer of the High United Free Church, he was the devoted friend of the late Dr. Walter Smith, the famous poet-preacher, and of the present minister, Dr. R. S. Simpson. The poor of the Lawnmarket district found in him a firm and zealous well-wisher; and in the social work among them he took an active part. In politics he was an advanced Liberal, and was a frequent speaker at party gatherings. In 1887 he joined the Edinburgh Merchant Company; and in the educational affairs of the Company he evinced a close personal concern. He was at one time an Assistant in the Company, and the Convener of the Educational Committee of the George Square Ladies' College.

Mr. Macfie was in his sixty-fifth year, and he leaves a widow, two sons, and a daughter. One of his sons is a doctor in Burnley, in partnership with a brother of Mrs. Macfie; and the other is a civil engineer in South America. The cause of death was heart failure. The funeral took place yesterday at the Warriston Cemetery, and there were present a representative gathering of business and other friends.

TWO APPRECIATIONS OF THE DECEASED.

A prominent Scottish Gas Engineer writes:

When the news of the tragically sudden death of Mr. Macfie came to be known among the gas fraternity, feelings of regret for the loss of a valued friend and colleague were widely expressed. His long connection with the firm of James Milne and Son gave him a prominence in the manufacturing as well as in the distribution side of gas affairs. His knowledge of meters and gas apparatus generally was wide and varied; and his experience, always at the disposal of gas managers, was freely given. It will be remembered that one of his patents was for the fixing of a governor inside consumers' meters with the view of increasing the pressures of supply; and while the meter had only limited attention paid to it in Scotland, the arrangement has made considerable progress in another country. For the past few years he had established a business in Edinburgh as an agent for gas-works requirements; and while the severance from his old firm was like laying aside his life's work, it is gratifying to know that his masterly activity as a hard worker made it a completely successful venture.

The death of Mr. Macfie removes one of the few remaining links that date back into the traditions of Gas Managers' Associations in Scotland. He appears to have made one contribution only to the "Transactions" of the North British Association, when at the meeting in Edinburgh in 1891 he read a paper on "Regenerative Gas-Lamps with Special Reference to the Lighting of Large Interiors." He was in very regular attendance at the Association meetings—Waverley, North British, and "Informal"—and frequently took part in discussions, giving point to his argument, and displaying a strong optimistic spirit as to the future of gas as an agent for lighting and heating, and always most mindful of consumers' interests and of how gas should be consumed. He was a ready and fluent speaker, and at functions where gas men were gathered together he did full justice to the occasion.

Mr. Macfie was a reader of character, and exhibited a special interest in the young men of the profession—ever willing to help anyone desirous of betterment, but one who must needs be worthy; while to many he was a confidential friend and adviser. In his professional dealings, it is but truth to state that he spurned methods that were opposed to pure and honest commercial business. His integrity and straightforward manner earned for him the highest respect. If on occasions his strong, determined attitude may have appeared oppressive and overbearing, it was, after all, only exhibiting the resources he possessed of a high standard of right and justice. He was no seeker after popularity or for any position of personal merit; and it is praise in his favour to state that some few with whom he differed widely in political and other matters were his dearest friends. He was a delightful companion, and as a raconteur of stories he had few equals. A striking quality was his possession of a retentive memory; and he was seldom happier than when quoting long passages from lyrical poetry. Not a few topical pieces of verse, dealing with gas and gas men, came from his pen, though this was known to only a few.

Two weeks ago, the writer met Mr. Macfie for the last time, and the incident that occurred was characteristic. A nocturnal visit had been paid to the small gas-works of a far North town (immortalized by the pen of a famous author), and some dozen or so workmen, idling together at the end of the day's rest, listened to our late friend reciting one of his pieces. In the quiet of the Sabbath evening, under the dirt-begrimed rafters of the retort-house, with only the bubbling noise of the dip-pipes to disturb, our friend gave of his best. The men listened with reverence, for the soul of the man was great. The story had a strong religious fervour, and we all felt the pathos and sympathy of his words. Looking back, the scene seemed like the work of the artist giving the last touch of his brush to make complete the picture of our earthly friendship.

A personal friend of the deceased of long standing sends the following:

Of Mr. Macfie's position and work in the world of gas engineering it is for others to speak. If, however, a friendship of more than forty years gives a man a right to speak of his friend, that, at least, I can claim. May I say at the outset that those who knew Mr. Macfie only in the way of business had very partial knowledge indeed of the man. And yet even his acquaintances in business knew right well that he could not altogether hide the bigger qualities that lay behind those that usually come to the front in the commercial world. There was ever something in his bearing that bespoke innate nobility. His handsome figure, his geniality, the deep-set, unambiguous eyes that returned to yours what yours gave to them, the humorous shrug of shoulder, the graceful gestures that formed so natural a part of his speech—all these made him a man of mark anywhere. But it was to those who were happy in his closer intimacy that he showed his inner qualities. I think the key-note of his life is best described by the word "loyal." He was loyal to everything and everyone to which and to whom he felt he owed loyalty. There was no wavering. He had splendid decision of character, and he was unalterably reliable. He put his heart—and it was a big one—into all that he felt had a true claim upon him; and he instinctively knew and chose the best. He was excellent company, and could "set the table on a roar" with his elocutionary powers. Rarely touching intoxicants, he, nevertheless, dearly loved a good cigar; and when the fragrant mist filled the little snuggery in his beautiful house in St. Alban's Road, Edinburgh, it was no symbol of his clear, well-ordered, and measured conversation—well-filled with reminiscence, story, and innocent jest.

A man of boundless energy, Mr. Macfie filled his days with many interests. An ardent United Free Churchman, he found the old faith sufficient to the last. He worshipped the memory of Dr. Walter C. Smith, the poet-preacher of the High United Free Church. It was, indeed, largely due to Mr. Macfie that the aged poet, not long before his death, agreed, almost unwillingly, to the republication of his various books of verse in one handsome volume. He remained to the end an enthusiastic admirer of the Rev. R. S. Simpson, D.D., the present occupant of the High United Free pulpit. In politics, he was an advanced Radical—impatient of slow progress, and a Home Ruler before Mr. Gladstone's conversion to the cause. When election times came round, he gave freely of his energies and his ability as a speaker to the cause he loved.

It is but three weeks since I played golf with Mr. Macfie over the pleasant course at Duddingston, of which club he was a member; and it seems but yesterday he brought to me as a gift "The Canadian Boat Song and other Papers" by Mr. Thomas Newbigging—whose unique place in the history of the gas industry has recently been so suitably recognized—pointing out with pardonable pride the words printed on its first page: "Inscribed to my friend, Daniel Macfie." Only a fortnight ago, after seeing the body of that distinguished painter, James Campbell Noble, R.S.A., laid to rest, I sat some time with Mr. Macfie over a cigar. He was a little graver than usual, telling me how he had recently made his will, and adding, quietly: "It is as well to set one's house in order." But the house he had set in order was "The House of Life"—a phrase Rossetti borrowed from Sir Thomas Browne—and included much more than material things. I shall always think of him as one of Nature's knightly order—a good man, brave, strong, sincere above all things. Can we doubt that the beautiful, clear, wholesome stream of energy that flowed beneficently through his mind and heart has found its way to widening and fairer issues? Surely not.

J. H.

A Naphthalene Engine.—A German engineering firm have constructed an internal-combustion engine specially designed to run on naphthalene, which requires to be melted in a special receptacle on the engine before it can be vaporized. The new fuel has been shown to have an economy 60 per cent. greater than that possible with the ordinary liquid fuel.

Combustion of Gaseous Mixtures.—This subject was dealt with by MM. Taffanel and Le Floch in a recent number of the "Comptes Rendus" of the Academy of Sciences [No. 157, pp. 469-71]. According to an abstract of the communication in the "Journal of the Society of Chemical Industry," we find that results are given showing that the temperatures of inflammation of mixtures of combustible gases with air vary according to the experimental conditions; being higher for example in small bombs than in those of larger capacity. In the case of carbon monoxide, inflammation occasionally occurred at about 375° C., probably owing to the presence of traces of carbon formed by dissociation of the monoxide. The minimum temperature of inflammation of mixtures of acetylene and air was 335° C. (40 to 55 per cent. C_2H_2), and the size of the bomb had no notable influence. In a bomb of 275 c.c. capacity, the following minimum temperatures of inflammation were observed: Ethylene (4·5 to 6·5 per cent.), 487°; ethane (4 to 8 per cent.), 560°; pentane (2 to 3 per cent.), 512°; commercial benzene (5 per cent.), 578°; motor spirit (2·2 per cent.), 481°; denatured alcohol (27 to 38 per cent.), 450° C. In nearly all cases, a more or less important lag in the inflammation could be detected.

ELECTRICITY SUPPLY MEMORANDA.

La Maison Electrique.

Among the posters at Metropolitan and suburban railway stations, is one of the greatest pictorial frauds of the day. On the poster are the words "La Maison Electrique." Pictorially represented is a many-gabled house, with a number of chimneys, which ought not to be wanted, excepting for ventilating purposes, in La Maison Electrique. In the foreground of the picture is a running stream, with a bridge over it. Over the bridge are winding paths leading up to the house. The actual thing at the Ideal Home Exhibition is a straight-lined stucco-panelled stand, partitioned off into small compartments, in which a very few visitors make an uncomfortable crowd. There are no pretty gables, no chimneys, no winding walks, no stream, and no bridge. Where the stream, bridge, and winding paths ought to be stand the excellent exhibit of the South Metropolitan Gas Company, against which exhibit La Maison Electrique wears quite an apologetic appearance. Close handy, too, are other stands demonstrating the heating value of gas for room warming and hot-water supply—proving the greater efficiency of gas, and a larger field of practical usefulness. La Maison Electrique is the result of the combined wisdom of the Electricity Supply Publicity Committee, and a round dozen Metropolitan Electric Supply Companies. We honestly say that we had anticipated that the thirteen participants in the venture would have done better in the creation of an advertisement for electricity. On the opening day of the exhibition, we made an inspection of the stand. The first thing to attract notice was a demonstration with a domestic electric iron. An elderly gentleman and a younger lady were standing by. The elderly gentleman asked if the iron was hot. The iron was held up for him to investigate for himself. The young lady smartly brushed the would-be test finger aside. The elderly gentleman was apparently a little annoyed by the interruption of the test, and, *sotto voce*, testily remarked: "An electric iron won't burn me, my dear." The young lady soothingly, and with superior knowledge: "But it may give you a shock." We passed on. The strip of a kitchen was inspected. A tiny blue-black joint was on the table, and a few pale-faced samples of puff pastry. A lady near-by called the attention of a lady companion to the size of the joint; and her friend observed that she would not much like to wait while an electric-oven cooked a larger one. Truth will out. There was the bath-room. No information was procurable there, at the time of the visit, as the expenditure of energy in capturing a bath of (say) 25 gallons of hot water, nor as to how long an interval had to elapse between the use of the bath in order to obtain a further 25-gallon supply of hot water. We noticed that, in a little den illustrating an office, there was indirect lighting; but at one corner of the stand, the visitor came upon, at eye-level (at any rate, one did at the time of the visit), glaring examples of eye-torturing (horizontally placed) metallic filament lamps, each with a little shell at the top to deflect the light downwards, but with the filaments fully exposed in the direct line of vision. This in a demonstration for the purpose of showing people how things ought to be done according to electrical laws! A fully grown man in a white jacket was seen walking about pushing a vacuum cleaner along, which reminded of the use of an elephant's trunk for picking up pins.

The Dining-Room and its Table.

We reached the much-advertised dining-room just in time to see a young lady visitor with her naked hand on the top of a radiator for the purpose of testing its thermal value. There was a peculiar smile on her face as she turned away. But the central feature is the much-talked of dining-table, which appears, in some cases, to divert attention from all else on the stand. The table, so some newspapers have stated, dispenses with the employment of servants. Of course, it does nothing of the kind. The servants must be elsewhere just the same to feed and relieve the mechanical brute. We first of all happened into the exhibition when the table was being put together. It is a thing that is fearfully and wonderfully made; and the cost of its construction must be as great as, if not more than, the cost of La Maison Electrique in which it has present habitation. There are not many of these tables in existence, and never likely to be. This one we believe was borrowed from M. Knap, the designer, of Paris; and, on the day of the opening of the exhibition, the table was not in complete working order—the information being given that all the parts had not arrived from Paris. At one end of the table, there is a sort of well with a rising and falling platform, euphoniously called a service-lift. The operator touches a button, and, with a startling click, down drops the platform. The servant concealed in the regions below places the dish, or whatever it is that is destined for the table, on the moveable platform, and—click! and a very metallic one too—up comes the platform with its burden. Towards the centre of the table is a sort of tramway route; and this is used for giving the viands a circular tour, and sending plates and so forth to the guests, or from the guests to the service-lift communicating with the world below. As a novelty, it is interesting; but who, save a lunatic, is going to the expense of having a mechanical arrangement of this kind in his house (with the worry that it must inevitably entail), we do not know. How it is the electrical industry should think that the exhibition of things of this sort is going to help their commercial campaign among the people, surpasses us. On the whole, certain electrical critics do not appear to be very proud of La Maison Electrique. We are not astonished; and certainly we fail to find that any particular amount of thought has been expended upon the equipment of the show. We need not notice the little booklet that has been prepared for circulation at the Ideal Home Exhibition. Such points (somewhat covertly presented) as we might fairly take exception to are fully counteracted by public experience; and the contiguity to La Maison Electrique of La Maison du Gaz of the South Metropolitan Gas Company, and other neighbouring stands laden with gas exhibits, will serve to remind the visiting public that it is not all truth that is electrically written. At any rate, it will be recognized that the whole of the information required to induce patronage does not appear in the brochure handed out at La Maison Electrique.

Eye Danger, and "Standard" Untruth.

Whoever is the writer on electrical subjects in the "Standard," he certainly indulges freely in generalization, and does not seem to be at all particular about the truth of some of his statements. An article from him upon the subject of the "Eye-Rest" system of lighting was published by our morning contemporary last week; and what he had to say constituted a nice little puff of this particular indirect system. There would have been no call upon us to notice the article, were if not for one statement which we are confident the writer cannot substantiate; and we are quite prepared to meet him upon it. He says quite truly that "the intense brilliance of the tungsten lamp has been considered bad because of its harmful effect on the visual nerves." It is mentioned that the old carbon lamps were so feeble and ineffective that it was necessary for them to be suspended close to one's work, and directly in the line of vision. When the tungsten lamp came into general use, this arrangement was still adhered to; and "a great deal of the eye-strain and nervous troubles which are so prevalent to-day may be attributed to this practice." We are pleased to see this acknowledgment, because incandescent gas-lamps were in use long before the tungsten lamp commenced its sight-destroying career; and there were no complaints of sight injury through the former in those days. The writer of the article goes on to say that "the use of exposed incandescent gas mantles is just as common, and *just as harmful*." The last part of this statement is absolutely untrue; and we ask the "Standard" writer to explain how an incandescent mantle of much lower intrinsic brilliancy than the filament of an electric metal lamp, and with a light of a composition nearer to daylight than that of the metallic filament lamp, can be "*just* as harmful" to the eyes? It is not honest to make such statements, which are, by anyone in the know, so easily demonstrated to be untrue. If the writer knows completely the subject on which he is writing, then the deception on the public is unpardonable. The public do not understand these things; and there are members of the public who believe anything they read in a newspaper. Once before there was a statement made in one of the articles in the "Standard" to which serious exception was taken; and though the Editor of our morning contemporary was addressed twice on the subject, he maintained a steady silence, and did not, so far as we were able to trace, insert the correcting letter. However, on this occasion, the writer in question, in giving a good advertisement to the "Eye-Rest" system of lighting, makes it quite clear that metallic filament lamps are very harmful; and, therefore, it follows that, in all the circumstances, the metallic filament lamp should not be employed without the protection for the eyes of the indirect or semi-indirect auxiliaries. Of course, there is an alternative, which he does not mention—that is, the wearing of coloured spectacles by all individuals occupying rooms where unshielded metallic filament lamps are in use. He might suggest this, in the interests of the electricity supply industry, in a future article. The present article concludes with this serious warning: "Medical men and oculists, who have the visual well-being of the nation at heart, will earn the gratitude of posterity if, by recommendation or example, they can induce the present generation to employ indirect lighting instead of the visible 'lumps of light' which have ruined so many eyes and caused so many headaches."

The Eyes of the Children.

The "Electrical Review" also calls attention to the same subject in an article headed "The Architect and the Electrician." It points out that "some amount of attention has been given to the subject of scientific illumination from a utilitarian point of view, in our public schools, as the result no doubt of the alarming increase in recent years of defects of sight among the young;" and it is urged that "scientific illumination should be considered much more seriously and thoroughly than up to the present it has been." We can entirely support our contemporary in this matter; for it is an absolute reproach to some of the school authorities that they should have committed to the untender mercies of gross intrinsic brilliancy metallic filament lamps the eyes of children and young people in the manner that they have done—in many cases, due solely to the desire to give the municipal electric supply undertakings additional customers. It was only at the recent International Medical Congress that testimony on this point of growing impaired vision among children and students was brought forward, and this was traceable to the period of the substitution of electricity for gas in the

schools. It is, indeed, a serious question—more so for the elementary schools under local educational committees than for the higher class schools, which can generally afford to have (if they do not always have) the lighting equipment converted so that there shall be proper protection for the eyes. The greater trouble is in those schools where, for the sake of economy, direct lighting by metallic filament lamps prevails—where, to put it bluntly, sight is sacrificed to economy in equipment, seeing that, even under the most ordinary installation of electricity, it is difficult to manufacture a case for justifying the expenditure on the conversion from modern gas illumination to electric lighting.

And Church Lighting.

Much the same applies to church lighting. Our ecclesiastical masters know little on the subject of illumination. They adopt electric lighting, at a big drain upon their perennially hungry coffers, while the conversion at less cost of old-style gas lighting to the new style would give them cheaper and far better quality illumination, and light that has not the same deleterious effects upon the eyes of the worshippers, to say nothing of the freedom from the trouble that occurs when there is a collapse of the light at such an inopportune time as a sermon on (say) "Let your light so shine before men," &c., or at the moment when an appeal is being solemnly made for a liberal offertory in order to meet the heavy expense incurred in installing the improv——— "Candles, please." That installations in churches are carried out in the most eye-abusing manner in order to cut down expense, is testified to by our "Electrical Review" friends who sometimes speak quite rationally, and do not always get hysterical, or exhibit always a double mood in a single article. Written in such rational mood that we can subscribe whole-heartedly to the statement, is this: "One only need visit some of the churches, even of recent construction, to realize how painfully elementary the practice of illumination is in this country. More often than not the lights are arranged so as to shine into the eyes of the worshippers, while a very frequent practice apparently is to suspend a powerful light over the pulpit in such a way that it exercises a hypnotic glare upon those who are striving to penetrate the profundity of the sermon." The quotation bears ample testimony to the fact that the writer of the words (at any rate) occasionally, if not frequently attends church. We hope that one good result of this will be a broader outlook on life and its affairs, a more charitable consideration of the live-and-let-live principle, a slackening of the thirst for the blood of a contemporary industry, a deeper penetration into the scientific aspects of a case before accepting as true the superficial side as presented by the daily press and laymen, and the cultivation of the excellent counsel as to casting the beam out of one's own eye in order to see clearly how to pull the mote out of the eye of a fellow-being. If all these good things do not happen, then the full intention of visiting churches will not have been fulfilled; for nowhere have we seen that the sole object of church attendance is the condemnation of the lighting arrangements.

The Half-Watt Lamp.

Beyond the general particulars that have been published, little has been learned of the technical aspects of the promised half-watt lamp. An article that has now been published in the American "General Electric Review" throws some light on the subject. From this it appears that there is very little chance of low-unit lamps of the new efficiency being produced, owing to the technical and physical difficulties surrounding the construction of such lamps. The "Electrician" has published an abstract of the article. One of the curious points about the construction of the lamp, in its high power form, is that the bulb contains an inert gas; and those who know anything of inert gases have been somewhat mystified as to the reason for its use, more especially seeing that, in the construction of ordinary electric incandescent lamps, a vacuum in the bulb is necessary to provide heat insulation—otherwise the efficiency is reduced by convection loss. When presenting the essence of the article from the American source, the "Electrician" says it appears from it that the determining factor in the problem was the blackening of the bulb, which has always been an unpleasant feature of glow lamps. This difficulty increases as the temperature of the filament is raised; and since a high temperature is essential for high efficiency, it became important to eliminate this blackening. The blackening is mainly due to the presence of water vapour, which causes oxide of tungsten (which is volatile) to be formed, and deposited upon the glass—being there reduced by the hydrogen which has been set free by the oxidation. Even in the absence of water vapour, some blackening will occur, due apparently to ordinary vaporization. It was concluded that the blackening might be mitigated either by the introduction of a gas such as nitrogen at atmospheric pressure, or by changing the location of the deposit by the convection currents in the gas, so that the bulb opposite the filament did not darken. Both methods have (the "Electrician" says) proved successful. Another point determined is that the heat lost by convection is more serious with small wires than with those of larger diameter. It is thus better to use filaments of large diameter, and so it becomes clear that such lamps are preferably made for heavy currents. Obviously, then, so far as can at present be seen, the $\frac{1}{2}$-watt lamp will only be used in large units, and for special purposes. The central station engineer breathes again, as with low-priced units for power and heating and cooking, he does not want to see the revenue from the high-priced units—the very backbone of his business—diminish.

Meteor's Blunders.

"Meteor" of the "Electrical Times" has either made another insensate blunder, or else he is trying to deliberately deceive his readers. Speaking of the South Metropolitan Gas Company's display at the Ideal Home Exhibition (which display by the way has drawn to Olympia a considerable number of visitors), he says that, "running from the middle of the stand to the outer air" is "a 40-feet length of flue-pipe." The insinuation, of course, is that this flue-pipe is for ventilating purposes. The Company have two stands. "Meteor" only mentions one in this connection; so that the other stand has no flue-pipe running from it. If "Meteor" had exercised the care that one expects from a journalist who imparts information to his readers (and in whose power it is to set falsehoods as well as truths in circulation), he would have seen that the length of flue-pipe is connected with the outlet of a coke-heated boiler, and has nothing whatever to do with the gas exhibits. He might also have mentioned that the fact of the coke-boiler flue being 40 feet long (assuming this to be the proper measurement) is due to the distance of the outer air from the Company's coke-heating demonstrating exhibit. We mention this matter only for the information of electrical readers of the "Memoranda," as past experience proves that, unless compelled to do so, "Meteor" is not in the habit of correcting (when the truth is placed in his possession) false statement or impression in which gas is concerned of which he is the author.

Gas Companies' Protection Association.

We learn from the Secretary of the Association (Mr. Fred. E. Cooper) that the sixteenth annual general meeting will be held at the Westminster Palace Hotel on the 30th inst. The business will consist of the reception of the annual report and accounts, the election of six gentlemen to serve upon the Committee in place of those retiring, and other matters. The retiring members of the Committee are Mr. William Belton, Mr. W. F. Cotton, Mr. Thomas May, Mr. S. Y. Shoubridge, Mr. Hanbury Thomas, and Sir Corbet Woodall, all of whom, with the exception of the last named, offer themselves for re-election.

New Motor Fuel from Paraffin.

A new fuel has been introduced under the name of "Economin," for the driving of motors. It has been subjected by the Royal Automobile Club to a trial in competition with petrol of the first grade, with, it is reported, highly satisfactory results. The trial was over 1000 miles of road; and a gallon of the new spirit, which has a basis of 80 per cent. of paraffin, allowed of 22·53 miles being covered, against 22·38 miles with petrol. At a luncheon at the Savoy Hotel last Tuesday, Mr. L. R. L. Squire, who presided, stated that the new spirit could be used not only in motor-cars but also in ordinary internal-combustion engines. As its main constituent was ordinary paraffin, it could be produced at a much cheaper price than petrol as it was at present. The Syndicate who were introducing the spirit claimed to have produced a fuel which would start and run as easily as petrol, with more power and less consumption and cost. Colonel C. E. Cassal, who is now engaged in investigating the matter, said there was no reason why crude paraffin should not, under the inventor's treatment, produce a substance giving all the results mentioned. Professor Lewes was present, and spoke in favour of "Economin."

The address which Mr. Charles Carpenter, D.Sc., gave at the British Association meeting [see "JOURNAL" for Sept. 16, p. 765] in answer to the question "Is Co-Partnership Incompatible with Trade Unionism?" is being issued as a threepenny pamphlet by Co-Partnership Publishers, Limited, of No. 6, Bloomsbury Square, W.C. Many of those interested in the gas industry will be glad to have this authoritative statement in a permanent form.

At the meeting of the Richmond Town Council last Tuesday, the Mayor (Alderman Bisgood) mentioned that on the 6th inst. Mr. W. G. Peirce (the Water Engineer of the Corporation) and Mrs. Peirce celebrated their golden wedding. He said fifty years of married life seemed to call for some notice, especially in the case of so old and esteemed an official as Mr. Peirce; and he offered him and Mrs. Peirce the Council's sincere congratulations.

The President of the Board of Trade has appointed a new Advisory Committee on Commercial Intelligence, in place of the one of which the term of office has recently expired. Among the members are Mr. Henry Birchenough, C.M.G., a Director of the Imperial Continental Gas Association and of the Continental Union and Danish Gas Companies, and Sir Hallewell Rogers, the Chairman of the Gas Committee of the Birmingham Corporation. With the members of the Committee are associated the Permanent and Parliamentary Secretaries of the Board of Trade and the Assistant-Secretary of the Commercial Department of the Board for the time being. The Chairman will be the President of the Board, or, in his absence, the senior representative of the Board present. The Committee, of which Mr. Percy Ashley has been appointed Secretary, will hold office for three years.

THE AMERICAN GAS INSTITUTE PROGRAMME.

[COMMUNICATED.]

ERE this, your readers will have seen the programme for the American Gas Institute meeting. As a preliminary to a later account of the meeting itself, a recital of the steps involved in obtaining the various papers and reports should prove interesting—certainly to those connected with British gas associations.

By the constitution of the American Gas Institute, the responsibility for the obtaining of papers and the making of investigations is lodged in the Technical Committee of six members, appointed annually by the President. The custom is now in the making, by which, at the end of his year of service, the Chairman of the Technical Committee is elected First Vice-President. This, however, does not entail his elevation to the presidency, as, so far in the Institute, such promotion by succession has not occurred.

There is another General Committee of six members—the Public Relations Committee, who control matters affecting the relations of gas companies to the public, and, therefore, would be responsible for papers and reports on such subjects. This Committee have, however, never done more each year than make a very brief report of their own.

The Technical Committee is supposed to cover the whole field of the gas business, including both commercial and new business details. As a matter of fact, it has always been composed of engineers, and, therefore, has produced an engineering programme. This year the President appointed a Commercial Committee; and they procured "Closer Relationship between the Engineering and Commercial Departments, by C. N. Stannard and F. Q. Cannon," and "How to Establish More Intimate Relations between Departments in the Administration of the Gas Business, by R. C. Ware." The rest of the programme, however, was, in the main, the direct result of the work of the Technical Committee as now described.

The first meeting of the Committee was held in November, and two Sub-Committees were appointed—one on the manufacturing and the other on the distribution programme. Each was instructed to report within a month upon subjects suitable for the programme. Here it may be said that the Technical Committee held monthly meetings throughout the year, and at no time were less than five members present, though most of them were located over 200 miles away. The Sub-Committee on the manufacturing programme wrote to representative gas engineers and obtained a list of subjects of most value to the industry. They were instructed to obtain committees or individual writers to prepare suitable reports on papers. From this resulted most of the papers listed on the programme under Section A. The Sub-Committee on the distribution programme approached their work in a different way. They decided to cover the subject of street-mains, both installation and maintenance, in as exhaustive a manner as was possible, with the hope that by so doing there would be obtained far more valuable street-main data than has as yet been in print this side of the water. Their programme was approved. In selecting the authors they endeavoured to have many State Gas Associations represented, while at the same time choosing the man best qualified for his subject. They obtained all the papers listed under Section B except the last two, which were proffered by the writers.

The Technical Committee at the first meeting decided to obtain all papers as soon as possible, in order that each member could have ample time to read those in which he was interested, and make notes or prepare written discussions. The first paper was printed in June, many were in print before September, and all but three in the hands of members a month before the meeting. To take full advantage of this favourable state of affairs, the Committee, by letter, invited written discussions on most of the papers from selected lists of members. This was done not with any idea of precluding the freest discussion from any number of volunteers, but in the belief that the largest good from each paper would be obtained by ensuring for it carefully considered comment from qualified critics. To afford sufficient time for such discussion, it was decided, also at the first Committee meeting, that each author must present his paper in abstract, in from ten to fifteen minutes. The preparation of these abstracts was entrusted to a Committee—a limit of 800 words being set—and each author was allowed to amend the abstract.

In general, the programme is based on an allowance of forty-five minutes for each paper, of which it is hoped that two-thirds will be occupied by discussion. The outcome will be awaited with great interest, because it is the first time that an Institute programme has been so well arranged to allow ample discussion time. The horse will be led to water; and if he does not drink, it will not be through failure of inducement, where compulsion is impossible. Certainly anyone who is thirsty for information in regard to the latest developments of surface combustion should be satisfied with the opportunity he has been given to study for a month over Dr. Lucke's lecture and come prepared to ask the questions which may result from this long consideration, and might not suggest themselves as the lecture was delivered.

In looking at the programme, it will be seen that the last session is a joint one, held with the Illuminating Engineering Society. The initiative was taken by the Society in its praiseworthy endeavour to emphasize the subject of proper illumination before every association of light purveyors. As planned, the first two papers were offered by the Society, and the last two by the Institute. It is very much to be regretted that at the last moment Mr. Westermaier was prevented by illness from preparing his paper on "Street Lighting by Gas."

HILL'S DYNAMIC DISTANCE LIGHTER.

THERE has recently been taken out by Mr. J. H. Hill and Mr. Herbert Buckle, of York, a patent for a very simple arrangement for distance gas lighting and extinguishing. The invention consists of a wall-switch connected by a steel wire and guiding-tube with a valve attached to the gas-burner, which is provided with a pilot-light. There is no spring or other mechanism to get out of order; the pull-and-push device being so arranged as to convey the necessary dynamic force to open and close the valve.

The essential point about the idea is that one must have the wire so approximating to the internal diameter of the guiding-tube that there is no room for the force to be dissipated by the kinking of the wire. If this is kept in mind, failure need not be feared. Preferably steel wire is used; and so long as there are not too many bends in the wire, the distance from switch to burner may be considerable. Say there was a run of 24 feet, this would permit of connection with a bracket 6 feet high, the placing of the wire for 12 feet along the floor (for the guiding-tube is so small that it can be run without inconvenience under the carpet, and be safe from damage), and the fixing of the switch 6 feet up on the opposite wall. A special valve with a plunger has been devised for use with the invention; and this can be operated with a movement either way of the wire extending to a quarter of an inch—the main gas supply being thus turned on and off by the backward and forward movements of the switch and wire.

There is, as already remarked, nothing to get out of order, and the appliance is easily fixed. It can be readily applied to indoor and outdoor lamps, as well as to gas-fires. The latter use, indeed, suggests a most delightful luxury—the fixing of a bye-pas to the gas-fire in one's bed-room, so as to be able, by the aid of a Hill lighter, to turn on the fire before getting even a foot out of bed in the morning, or to put a fire on or off at will during the night without raising the head from the pillow. For lighting, the valves can be placed either inside or outside the fitting, and they may be vertical or horizontal to suit the circumstances. During his very long connection with the York Gas Company, plenty of opportunity must have been afforded Mr. Hill of ascertaining just what is likely to take a consumer's fancy; and he has great confidence that his dynamic lighter will do so.

Midland Junior Gas Association.

At the first meeting of the Association for the present session, Mr. E. W. Smith congratulated the President (Mr. W. H. Johns) on the excellent programme that had been arranged; and Mr. Johns, in reply, remarked that he had tried to make it a good carbonizing year. That he has been successful in this endeavour will be gathered from the details of the programme. On Nov. 8, there will be a visit to the coke-ovens at Saltley; and on Dec. 13, one to the coal-testing works at Nechells, with a paper on the plant by Mr. G. C. Pearson. Subsequent fixtures are as follows: Jan. 10, 1914, visit to the Windsor Street works, and a paper by Mr. C. F. Tooby, entitled "Notes on the Woodall-Duckham Installation of Vertical Retorts." Feb. 14, annual dinner, and an address by Mr. F. J. Bywater. March 14, visit to Leicester, to inspect the Glover-West vertical retorts. April 11, annual general meeting, and a paper by Mr. B. F. Botwood, on "High-Pressure Gas Supply and Reinforcement, and Low-Pressure Standardization." April 25, visit to the East Greenwich works of the South Metropolitan Gas Company. May 9, visit to the Stourbridge Gas-Works and Kinver.

Society of British Gas Industries.—The autumn general meeting of the Society of British Gas Industries will take place at the Trocadero Restaurant, Piccadilly Circus, W., on Thursday, Nov. 20, when the President, Professor Harold B. Dixon, Ph.D., F.R.S., will take the chair. The members will dine together after the meeting.

Gas-Works Directory and Statistics for 1913-14.—We have received from the publishers, Messrs. Hazell, Watson, and Viney, Limited, of No. 52, Long Acre, W.C., a copy of the "Gas-Works Directory and Statistics" for 1913-14. This is the thirty-sixth annual issue of the work, and every effort has been made to get the latest and fullest returns available—the contents having been revised to August last. As in previous issues, acknowledgment is made of the courtesy of the engineers, managers, and secretaries of the various undertakings in supplying the data from which by far the greater part of the book has been compiled. In addition to the statistics given under the names of the different towns, there is an alphabetical list of the chief gas-works officials; and particulars are given in regard to the Senior and Junior Gas Associations—including the names and addresses of the Presidents and Secretaries, the number of members, and the dates and places of meeting. The price of the book is 10s. 6d. net.

WORKS TOPICS.—III.

By "Modus Operandi."

Accident prevention can justly lay claim to being one of the most important duties of the works manager. It is interesting, therefore, to record the striking innovation recently made by the Grand Trunk Railway of Canada in the appointment of a "Safety Engineer." Railway accidents are so closely concerned with the public safety that it is not surprising that railway companies should lead the way in all matters connected with accident prevention. Bearing in mind, too, the disastrous accidents which have recently occurred in this country, we might well be surprised if stringent precautions were not taken to prevent, as far as possible, the recurrence of such unfortunate catastrophes. The new "Safety Engineer" will hold meetings at all important centres of the system, and will give practical instruction, bearing on safety methods, to employees in all departments. He will further appoint district committees to investigate and correct dangerous conditions and practices. The idea is undoubtedly a very good one, and putting this particular responsibility upon one pair of shoulders will probably result in substantial progress being made in safety methods on the railway in question. It is to be hoped that other railway companies will follow the lead of this large Canadian railway.

This innovation is mentioned for the purpose of recommending a similar scheme in gas-works. It is obviously not possible to appoint in any one works an engineer solely for this purpose, but it is quite feasible to entrust one assistant in a large works with this special duty. Provided he is worth his salt, he will study the whole question, and once and for all show the way to a general adoption of safer methods of working in many directions. He will see that all the requirements of the Factory Acts are strictly complied with, and will remove the causes of many needless risks which workmen are so prone to take as part and parcel of their daily work. The provision of safeguards is usually left to the works manager, and if, as is often the case, he is a busy man, the whole matter is liable to be shelved until some serious accident occurs. When one considers the terrible disasters that can and do occur in gas-works, is it wise to do nothing and not seriously tackle the question? The dangers of explosions and fires are so severe as to warrant particular attention. So do such questions as the adequate fencing of machinery and shafting; the upkeep of floors, staircases, walls, gantries, and gangways; the condition of ropes, chains, and lifting tackle; the inspection of boilers; and the ventilation of purifier-houses and other parts of a works where accumulations of gas may occur. Not every engineer is fitted for such work as this; only a really capable man would do it well. In any case the matter calls for the earnest consideration of every responsible works official, and there is no doubt that time and study spent in safeguarding the methods of the every-day routine of a gas-works will be amply repaid in the decrease of accidents, and the increased efficiency of labour.

Calorific Power Standards.

Most managers of works will have been interested and surprised in reading the striking experiment mentioned by Mr. Goulden in his presidential address to the Eastern Counties Association. To obtain a make of 15,840 cubic feet of comparatively good gas per ton from a first-class Durham coal is truly astonishing. The composition of the gas and the calorific power obtained—viz., 530 B.Th.U. gross, and 470 B.Th.U. net—were also very satisfactory, especially considering that the illuminating power was no more than 12·15 candles. In advising the adoption of calorific in place of illuminating power standards, the President could not have emphasized his remarks better than by quoting this enlightening experiment. The possibilities of carbonization under a calorific power standard are so great that the matter should have the earnest consideration of all progressive engineers. It would have been interesting had Mr. Goulden told his audience the weight and duration of the charge, the temperature of the retort, and the pressure maintained in the retort throughout the experiment; also whether the hydraulic main was sealed or fitted with anti-dips. Unless these points are known, it is difficult to appreciate the conditions of the experiment.

Mention of the calorific power standards of the Wandsworth, Wimbledon, and Epsom, and the South Suburban Companies prompts the remark that many gas engineers are awaiting their experience with the greatest interest. In each case the nominal calorific-power standard is but very little higher than the calorific power of the gas obtained in Mr. Goulden's experiment, while the penalty figure is far below it; so that the possibilities before these Companies are very significant, to say the least.

B.Th.U.'s per Penny.

At the present day we all are alive to the fact that the point to keep well to the front is the number of B.Th.U.'s that can be sold for one penny. So long as a company continues to increase this figure, it is doing its duty to the consumers. It is no use reducing the price by one penny per 1000 cubic feet—equivalent to, say, a 3 per cent. reduction—and lowering the quality by 5 per cent. Until a company can see its way clear to giving the consumer more B.Th.U.'s for his penny, it is better not to attempt to lower the standard of the gas being supplied. It is, of course, unnecessary to labour this point. Even if the standard of the quality permissible is lower than the quality supplied, it does not follow that it is good policy to reduce the quality, for in doing this it must be remembered it is only the cost of manufacture that can be decreased by lowering the quality of the gas made.

Assuming that the price is 2s. 6d. per 1000 cubic feet, and the quality supplied is 550 B.Th.U. gross; assuming also that the standard allowable is 500 B.Th.U. gross, and that the cost of manufacture is 9d. per 1000 cubic feet. By reducing the quality of the gas made to 500 B.Th.U. gross, we will assume that the gas can be made at the works for 8d., instead of 9d. If this were done, the result would be that the price could be lowered to 2s. 5d.—a reduction of 3·33 per cent.—while the quality would be dropped from 550 to 500 B.Th.U., a reduction of 9·09 per cent. In the same way the B.Th.U.'s obtainable per penny would be reduced from 18,333 to 17,241. The point is that the whole burden of reducing the cost of making the lower-grade gas is thrown on to the works. The distribution and capital charges, the expenses of management, and rates and taxes are so heavy, commonly amounting to about two-thirds of the total cost of making gas, that the decrease in works charges must be very substantial to permit of a sufficient reduction in price to warrant a decrease in the calorific quality of the gas supplied.

JOHNSTONE GAS-WORKS EXTENSIONS.

An Installation of Wilson Verticals.

A company of about a hundred assembled at the Johnstone, Gas-Works last Wednesday, to inaugurate an installation of vertical retorts and purifiers.

The visitors were received by Provost Armour, of Johnstone who, in extending a welcome, said that their late Manager, Mr. Deans, who had served the Corporation for over 30 years, had superintended a good part of the work which had been completed that day. While the death of Mr. Deans had been a great loss, they were proud that they had appointed such an able successor as Mr. James Dickson, who came to them with the best recommendations. But Mr. Dickson had already pointed out that before long they would require another extension. The gasholder capacity was not sufficient. The daily output was 450,000 cubic feet, while the storage capacity was only 300,000 feet. Mr. G. R. Hislop, jun., of Paisley, had erected the vertical retort installation; and if they had been long on the work, it must be attributed to the coal strike.

The visitors, who were shown round by Mr. Dickson and Mr. Hislop, greatly admired the compact nature of the installation, its clockwork regularity, and smooth working. It consists of eighteen retorts, each 23 feet long, by 48 in. by 18 in. at the bottom, tapered to 40 in. by 10 in. at the top. Each is capable of carbonizing 3 tons of coal per day; and the production is 550,000 to 600,000 cubic feet of gas per day of 24 hours. The system adopted is that designed and patented by Mr. Alexander Wilson, of Glasgow, which works so admirably in the 5 million cubic feet plant at the Dawsholm Gas-Works of the Glasgow Corporation. The Johnstone plant, which can deal with almost any kind of coal, has been planned so as to avoid complicated parts and be so simple that any ordinary stoker can readily understand and work it. The inspection on Wednesday tended to show that this aim has been achieved.

The coal is fed into the retorts every four hours, about 10 cwt. at a time; an equal bulk of coke being withdrawn at the bottom beforehand. The bottom of the retort is water-sealed; and while the coke is being withdrawn, it is finally cooled with water, which has the effect of keeping it soft and more suitable for domestic purposes. The special bogie into which the coke is drawn regulates the amount taken out. Coal and coke storage hoppers are placed overhead, side by side, and are of about 48 hours' capacity, or a total of 100 tons of coal and 15 to 20 tons of coke approximately. The water-containing buckets forming the base of the retorts are opened and closed by a small hydraulic ram; the high-pressure water supply being obtained by a hydraulic installation consisting of a duplex pump suitable for a steam pressure of some 60 lbs. per square inch, and working against a hydraulic pressure of 600 lbs. per square inch. It has a capacity of 300 gallons per hour. The accumulator is provided with automatic starting and stopping gear, which, as soon as it is filled, closes the steam inlet-valve to the pumps, and when water is drawn off opens the steam-valve and starts the pumps again. Provision has been made in the ram of the accumulator that it cannot be forced out of its cylinder. There is also a relief valve as a stand-by, should the automatic gear break down at any time. The coal for the retorts is emptied direct from the waggons, by means of a hydraulic ram tipper, placed in an underground chamber, into a coal-receiving hopper of about 10 tons capacity, sunk flush with the floor, through which it passes on to a jigging screen, where the small coal is diverted direct to the elevating buckets and the larger lumps into a powerful coal-breaker. The conveyors are of the endless chain gravity bucket type, and are capable of elevating 20 tons of coal per hour when travelling at a chain speed of 45 feet per minute.

The whole plant is driven electrically; an up-to-date generating station being installed for this purpose. It consists of a protected compound type generator, and is driven by a Robey high-speed

steam-engine of 30 B.H.P. The current generated is used for driving a 10 H.P. motor of the enclosed type, driving the coal-breaker, and a 5 H.P. motor for driving the conveyor.

There are four purifiers, 30 ft. by 20 ft. by 5 ft. deep, capable of dealing with 1,000,000 cubic feet of gas per day. Oxide of iron entirely is used for the purification of the gas, and this is supported on one layer of wood grids and three tiers of Dempster's patent purifier-bars. The covers are eight in number, 16 ft. 8 in. long by 13 ft. 8 in. wide. The purifiers are also fitted with Green's patent leak detector. The connection to the four purifiers is accomplished by means of a 16-inch centre-valve, by which any of the four purifiers can be worked separately, any two can be worked together, or any three or all four in consecutive order. The large area of the purifiers, the method of holding-up the oxide lightly so as to obviate back-pressure, and the manner of fixing the purifier-cover down by means of an india-rubber joint, are improvements upon the older plans which will repay themselves in a short period; while the saving in labour in the use of oxide as compared with lime, and the absence of all nuisance, are factors that go to make the daily routine of gas manufacture work very smoothly.

In all, the new installation consists of the vertical retorts, purifiers, boiler, boiler-house, and chimney, meter, and meter-house. The capacity of the meter is 40,000 cubic feet of gas, and the working pressure of the boiler 100 lbs.

At the conclusion of the inspection of the works, the visitors were entertained at tea by the Provost, Magistrates, and Councillors, in the Lesser Town Hall.

Provost ARMOUR presided, and explained that the Johnstone Town Council took over the undertaking in 1880, at a cost of £22,957. They had had a great many extensions since then; the first taking place immediately after they bought the works—a new scrubber being put up. In 1885, retort-benches and new purifiers cost them £1079; in 1890, a gasholder and a new coal-shed cost £5140; in 1898, a gasholder and purifier cost £1326; in 1901, new retort-benches, sheds, and offices meant the expenditure of £10,240; while in 1907, there was an outlay of £1561 on sulphate of ammonia works. The present extensions had cost to date £12,527, and the debt was £35,270. The make of gas in 1879-1880 was 18,822,000 cubic feet, compared with 91,276,000 cubic feet in 1912-1913. The price of gas in 1880 was 5s. 5d. per 1000 cubic feet, and the present charge 1s. 10d. In 1880, residual products yielded £187; while last year the return was £5551. He thought this was a very good history. A month or two ago they had managed to light up the neighbouring village of Horwood; and he believed that before very long they would have an application from the village of Kilbarchan.

Ex-Provost LANG, in proposing the toast of the Johnstone Gas-Works, said that they were started in 1824. About that period there were from eighteen to twenty cotton-mills; and he supposed the cause of the gas-works being erected was because the mills could not get along very well without gas. The Corporation, as they had heard, had paid £22,957 for the works in 1880; and to-day there was practically nothing remaining for this money but a few old buildings At that time, there was a great deal said about a bad bargain being made by the Johnstone Town Council. One member was reported to have said that in two or three years the cost would go up to 8s. per 1000 cubic feet. Now they knew that this man was a false prophet. So far as he was aware, there were only two gas-works in Scotland now selling gas at less than Johnstone's price of 1s. 1od.; and these two were situated within the coal district, where coal could be procured easily. He would like to mention that the first Manager of the Johnstone Gas-Works was Robert Blair, a grandson of whom they had with them that day. Mr. Dickson, their new Manager, came to them with a most excellent record; and he might say they would try to aid him in every way possible, so that he might remain with them and continue to make the works as successful as they had been in the past.

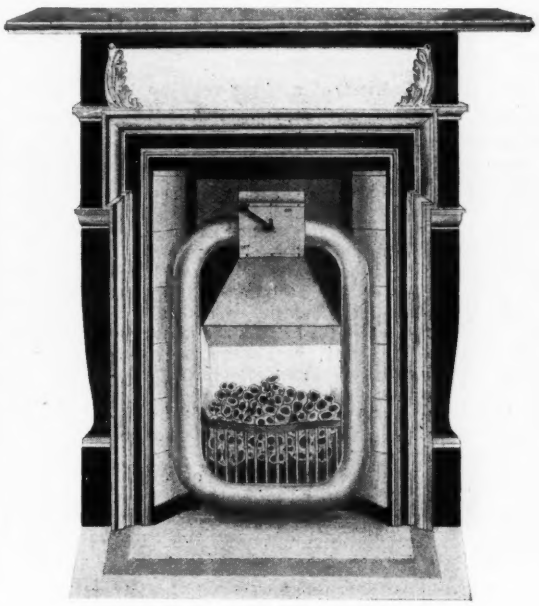
Bailie STIRLING replied, and the other toasts were proposed or responded to by Mr. FISHER (Provost of Rothesay), Mr. J. B. STIRLING, ex-Provost SHANKS, Bailie W. B. LANG, Mr. G. R. HISLOP (Paisley), Bailie MILLAR, Mr. DAVID VASS (Perth), and Mr. ROBERT SEMPLE.

THE RECUPERATOR ADAPTED TO THE GAS-FIRE IN THE GRATE.

THERE is a new invention to be seen at work in the show-room of the Gaslight and Coke Company, Horseferry Road, with a Fletcher fire which economizes the large amount of waste heat which is lost up the chimney when the fire is arranged to suit an ordinary grate.

As will be seen by the illustration, instead of the usual canopy, Mr. Killingworth Hedges, M.Inst.C.E., the patentee, has inserted a valve-box upon the flue opening from the fire, and connects this to piping carried down one side of the fire, across the front, and up the other side to the upcast flue. By a slight alteration of the grate, the pipes may be concealed in the space now occupied by the tiles, or it may be made of a section to fit the sides of the grate, and brought forward as a flat plate in the front, which can be utilized for keeping (say) the breakfast hot. The change from a coal-fire to a gas-fire with a recuperator can be quickly made, with the advantage that a very considerable amount of heat that would otherwise be wasted up the chimney is utilized for warming the room.

The arrangement of working is extremely simple. On first of all lighting the fire, the valve is kept open and the products escape



Killingworth Hedges' Recuperator Gas-Stove.

direct to the chimney. After a few minutes, by raising the arrow-shaped handle they are diverted round the pipes, and the additional convected heat is very noticeable.

FERTILIZING VALUE OF SPENT OXIDE.

M. DEMOLON, the Chief of the Agronomic School of the Department of the Aisne, recently contributed to the "Annales de la Science Agronomique" an article on the use of spent mineral iron oxide in agriculture, which has made considerable progress in France during the past decade. The following abstract translation of the article appeared in the "Chemical Trade Journal" for the 11th inst.

In a table of analyses, M. Demolon shows that the nitrogen and sulphur content of spent oxide are as follows: Nitrogen as soluble ammonia, up to 2·94 per cent.; as insoluble ammonia, up to 0·756 per cent.; as sulphocyanides, up to 1·39 per cent.; as insoluble cyanogen compounds, up to 1·39 per cent.; as ferrocyanides and ferricyanides, up to 2·702 per cent. (making a total nitrogen content of up to 9·1 per cent.); sulphur in the free state up to 40·5 per cent., and as sulphate up to 3·63 per cent. The nitrogen in the insoluble cyanogen compounds cannot all be transformed into ferrocyanides; a part of it is converted into ammonia when treated with sulphuric acid. In the soluble ammonia compounds, the nitrogen almost entirely takes the form of sulphate and sulphocyanide. None of the samples of spent oxide were found to contain sulphide of iron.

The fertilizing action of spent oxide is undoubted; but it is attributed rather to the sulphur content, in its fine state of division, than to the nitrogen, Vegetable growth is very favourably affected by the use of flowers of sulphur in non-sterilized soils; it encourages the growth of certain micro-organisms, and hinders the development of others. Moreover, it favours the formation of chlorophyll in the leaves of the plants. In presence of micro-organisms, the sulphur oxidizes into sulphuric acid; and if lime or potash is found in the soil, it forms sulphates. With light and sandy soils, however, the soil becomes sour owing to the absence of anything to absorb the sulphuric acid. Further, the action of sulphur may be nullified by the addition of too much farmyard manure or mineral fertilizer. It has been observed that, provided the soil is not too light, potatoes benefit considerably by the use of spent oxide. With an equal quantity of nitrogen, sulphur gives similar results as a full treatment of superphosphates.

The body of Dr. Diesel, who disappeared from a steamer between Antwerp and Harwich on the 29th ult., was found in the sea last Saturday week. There appears to be no doubt that his death was the result of troubles arising from financial difficulties due to imprudent speculation and lack of business judgment. He had realized everything possible, even his life insurance, shortly before his death. The deficit in the estate amounts to about £25,000 on account of ordinary debts, and about £30,000 on mortgages. The assets consist solely of mortgaged property. A meeting of creditors was held in Munich last Tuesday, when it was unanimously decided to avoid bankruptcy proceedings if possible, and to liquidate the assets gradually; and a Committee of five was formed for the purpose. Dr. Diesel's family were unaware of his financial position, and are left entirely unprovided for. His admirers propose to form a fund to secure a pension for the widow.

MODERN BYE-PRODUCT COKING.

This was the subject of a paper read by Mr. G. STANLEY COOPER, B.Sc., F.C.S., at the meeting of the Junior Institution of Engineers last night.

In his introductory remarks, the author pointed out that bye-product coking now forms a very important branch of the mining industry of this country, and the development of coke-oven engineering is due entirely to the application of scientific method to an otherwise wasteful and uneconomic, though profitable, commercial process. The coking industry is very closely associated with the iron and steel trade; but it is often lost sight of in this connection, and its immensity is not fully appreciated by many of those who profess to be well acquainted with all the details of the iron trade. Some idea of the importance of the coking industry can be gathered from very interesting information which is contained in the annual report issued by the Chief Inspector of Mines (section on Mines and Quarries). According to the report for 1911, the total weight of coke manufactured (other than at gas-works) was 11,474,174 tons, representing an approximate coal consumption of 20,000,000 tons. Of this quantity, approximately half was made in beehive ovens without recovery of bye-products. Since 1911, however, bye-product ovens have been gradually replacing the old type, and at the present time all the coke-oven builders are extremely busy erecting new plants.

DEVELOPMENT OF THE COKING INDUSTRY.

The manufacture of coke for metallurgical purposes commenced about the beginning of the Seventeenth Century; but it was not until the introduction of the hot blast in furnace work that coke was utilized to any extent. Prior to the year 1861, the only method in use for the manufacture of coke was by means of the beehive oven; but in that year a new type was introduced—viz., the Coppée retort oven. This plant was the forerunner of the modern bye-product recovery oven, and large numbers were erected and successfully operated throughout the world. Several attempts were made to work them; but it was not till about the year 1880 that the firm of Simon Carvès, Limited, of Manchester, erected the first really successful installation. Only a few years after the Simon-Carvès plant was erected, a battery of Semet-Solvay recovery ovens was built. Since that time great progress has been made, both in the design of the ovens themselves and in the method of working them, and also in the processes adopted for recovering the bye-products.

Much opposition was manifested at first to the coke made in bye-product ovens; and for a long time many ironmasters declared that it could not be used for furnace work. The experiments made on a practical scale by the late Mr. C. Lowthian Bell did much to remove this prejudice; but even to-day there are people connected with the iron industry who will not on any account use anything except beehive coke for their foundries. No scientific reason can be put forward in favour of this coke; and, from an economical point of view, it does not compare favourably with bye-product coke—being always a few shillings higher in price than the latter. In Germany there is practically no beehive coke to-day; and as almost every class of ironwork is manufactured there which is also made in this country, it is difficult to see what real objection English makers have to bye-product coke.

With the majority of beehive ovens, coke is the only product; while with the bye-product ovens there are obtained coke, tar, sulphate of ammonia, and benzol, together with a large quantity of illuminating gas, which can be used in gas-engines or for other purposes. Taking the case of a typical South Yorkshire coking coal, this carbonized in beehive ovens would yield about 60 per cent. of coke. In bye-product ovens, the yield of coke would be at least 70 per cent.; while the products obtained would be approximately 5 per cent. of tar, 1·5 per cent. of sulphate of ammonia, 1 per cent. of benzol, and 5500 cubic feet of surplus gas per ton of coal—*i.e.*, assuming that regenerative ovens were used. On an average coking plant, the battery consists of fifty ovens, carbonizing (say) 100,000 tons of coal per annum. On the above basis, the yields from such coal would be as follows:—

	In Beehive Ovens.		In Bye-Product Ovens.
Coke	60,000 tons	..	70,000 tons
Tar	Nil	..	5,000 ,,
Sulphate of ammonia	Nil	..	1,500 ,,
Benzol	Nil	..	1,000 ,,
Surplus gas	Nil	..	550 million cub. ft.

With the increasing use of tar for road-making purposes, of sulphate of ammonia as a fertilizer, and of benzol for motor spirit, it is evident that the country is losing an enormous sum every year by neglecting to recover all these valuable constituents of coal. The amount of power which could be developed by the utilization of the surplus gas in internal-combustion engines is almost inconceivable.

METHODS OF HEATING THE OVEN.

There are two systems of heating the ovens in general use—viz., (1) by means of vertical flues, and (2) by means of horizontal flues. The former is more popular, though the latter has met with success both in this country and in America. The usual dimensions of a bye-product coke-oven are 33 ft. long, 7 ft. 9 in. high, and 1 ft. 8 in. wide in the middle; there being a slight widening towards the discharging side, so as to facilitate the discharge of the coke from the oven.

There are two distinct modifications of coke-ovens in general use—viz., the waste-heat oven and the regenerative oven. In the waste-heat oven, the heating gas is supplied with cold air for combustion, and the hot waste gases resulting from the combustion are led away by means of a flue to a range of steam-boilers, where the heat is abstracted from the gases—the latter then passing to the chimney. In the regenerative type of oven, the air for combustion is preheated to a high degree in regenerator chambers of the Siemens type, and consisting of chequer brickwork. With both types of ovens equal results are obtained, so far as the quantity and the quality of the products are concerned.

The following is a comparative statement of the power obtainable from batteries of (*a*) 50 waste-heat ovens and (*b*) 50 regenerative ovens respectively. Such a battery would carbonize approximately 300 tons of coal per day.

Waste-Heat Ovens.

About 320 tons of steam raised per day.
Usual type of colliery steam-engine consumes about 22 lbs. per B.H.P. hour.

$$\text{Power obtainable} \ldots \frac{320 \times 2240}{22 \times 24} = 1360 \text{ B.H.P. per day.}$$

Regenerative Ovens.

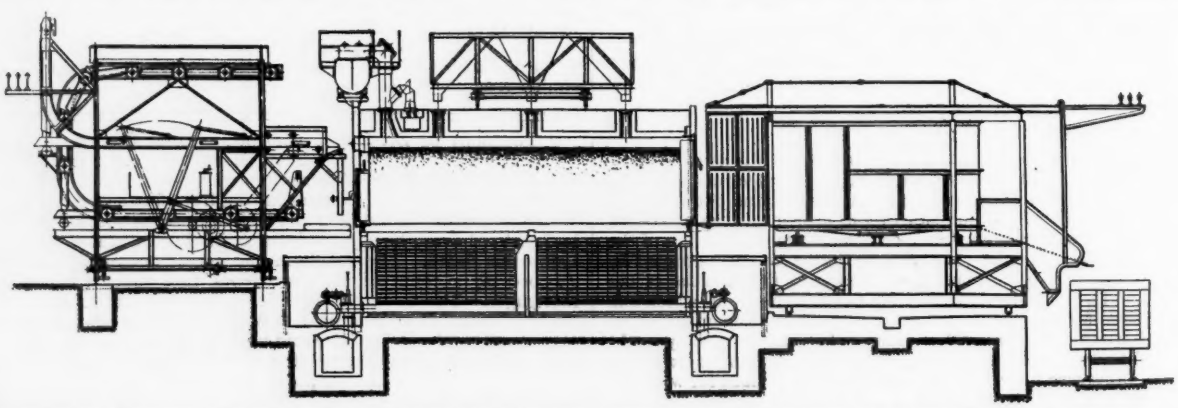
Each ton of coal yields approximately 11,000 cubic feet of gas; 5500 cubic feet of surplus gas per ton.
Large gas-engines utilize about 21 cubic feet per B.H.P. hour.

$$\text{Power obtainable} \ldots \frac{300 \times 5500}{21 \times 24} = 3275 \text{ B.H.P. per day.}$$

The recent introduction of the Bonecourt boiler, working on the principle of surface combustion, will undoubtedly have some effect in time on the method of dealing with surplus gas. These boilers are eminently suitable for plants where a large volume of gas is available at a low cost, such as is the case on coke-oven plants with regenerative ovens.

COKING AND NON-COKING COAL.

Unfortunately (from the point of view of many colliery owners), all coal cannot be converted into coke. Many varieties of coal do not possess the caking property by virtue of which the particles of coal adhere together on carbonization, and form a dense and homogeneous mass of coke. Generally speaking, a coal which contains a high percentage of oxygen possesses little coking power, though there are several well-marked exceptions. Different coals behave in different ways when carbonized under the same conditions; and consequently the method of treating the coal has to be adapted to the particular class to be dealt with. Generally speaking, a coal containing above 25 per cent. of volatile matter has to be compressed, while coal with less than 25 per cent. is



SECTION THROUGH THE OVEN, SHOWING THE PUSHING AND LEVELLING MACHINE, THE COAL CHARGING MACHINE, AND THE COKE QUENCHING MACHINE AS ADOPTED AT BIRMINGHAM.

charged in the normal state. These methods are adopted with all types of ovens, as the principles of coking involved are the same in every case.

Essentials of a Good Oven.

The essential features of a good coke-oven may be generally stated as follows: The heating of the ovens must be easy to regulate and control. The temperature should remain the same throughout the whole length of the oven wall, in order to produce a homogeneous coke. Ample means for controlling both gas and air supplies should be provided. All working parts of the oven should be easily accessible for inspection and regulation, and without discomfort to the workmen. The quantity of gas required for heating the ovens should be reduced to the minimum, and the largest possible amount of surplus energy should be produced without decreasing the output of bye-products. The ovens should be of substantial construction, but simple in design; and great care should be bestowed upon the foundations, as any subsidence would mean serious damage to the ovens. It is particularly necessary to note the nature of the foundations, and to take any precautions against the possible effects of the heat of the ovens.

The author then gave a detailed description of what is regarded as one of the best known and most successful types of coke-ovens and bye-product recovery processes—viz., that designed by Heinrich Koppers, of Essen Ruhr, Germany—this being the system with which he is most familiar. This oven was designed only about ten years ago; but it met with great success from the first—upwards of 11,000 being now in operation and under construction in all parts of the world. The oven is of the vertical-flue type, and is adapted for use either as a waste-heat oven or as a regenerator oven. It is a development of the old Otto-Hoffmann oven, which for about twenty years was the most popular one on the Continent.

In order to obtain perfect uniformity in the heating of the ovens, it is necessary to be able to regulate the gas and air supplies to each flue. Older ovens were not provided with facilities for inspection and regulation, and to get at the flues it was necessary to remove a considerable portion of brickwork, thereby involving stoppage of the plant, as well as great expense for labour. The system of combustion and carrying-off of waste gases should therefore be simple and easily accessible; and in designing the Koppers oven this was achieved. Openings were made in the top of the ovens, one over each flue, by means of which the gas-admission nozzles at the base of the flue could be taken out and replaced with the least possible trouble. In order better to regulate the combustion, over each flue was provided a sliding brick which could easily be adjusted from the top of the oven. By means of these bricks, the draught in each flue can be accurately regulated; and it is found in practice that the combustion can thereby be perfectly controlled, and any defects in the heating be immediately corrected.

The Koppers Waste-Heat Oven.

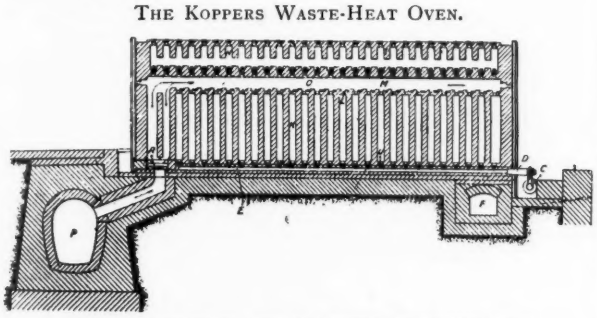


Fig. 1.—Longitudinal Section through the Heating Flues.

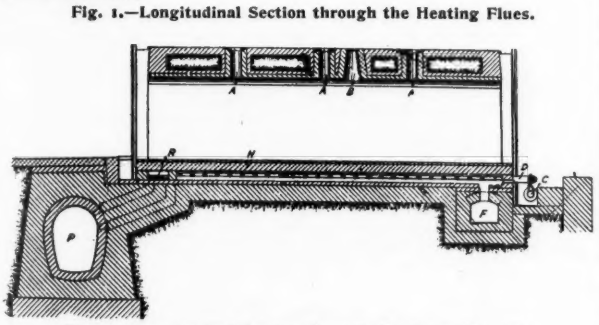


Fig. 2.—Longitudinal Section through the Oven Chamber.

The illustrations show longitudinal and cross sections through the oven chamber and heating flues respectively. Fig. 1 is a longitudinal section through one of the walls, and shows the arrangement of the heating flues; fig. 2 is a longitudinal section through the oven chamber. The oven is a chamber about 33 ft. long, 7 ft. 9 in. high, and from 20 to 24 inches wide in the centre, and is capable of holding a charge of 8 to 10 tons of coal. The height and width, however, vary somewhat according to the class of coal to be coked. The top of the oven is provided with three openings A for charging the coal, and a fourth opening B through which the gases of distillation are drawn off to the condensing plant. In some cases, however, the coal is charged into the oven through the door. The purified gas is returned from the bye-product plant by the main C, placed in a position convenient for access, either in the front or at the back of the battery of ovens. Separate branch supply-pipes D, each fitted with a regulating cock, conduct the gas to each oven. These pipes communicate with the gas-distributing channel E, placed immediately below the heating flues. This channel is formed of fire-brick pipes, and runs along at the base of the whole of the heating flues, with the exception of one or two at the end remote from that at which the gas is admitted; and the latter flues conduct the waste heat to the main flue P, leading to the steam-boilers. The heating gas passes out of the distributing channel through orifices, each fitted with a gas-nozzle communicating with each vertical flue. The air for combustion flows along the conduit F, and, induced by the chimney draught, it is drawn into the air-distributing channels G, situated immediately beneath the oven chambers. The air enters each heating flue through the openings H, and meets the gas issuing through the gas-nozzles U. Combustion takes place a little above the nozzle; and it is to be particularly noticed that the comparatively cold air flows around the base of the nozzle, keeps it cool, and prevents any likelihood of the nozzle setting fast. The products of combustion of the gas and air pass up the heating flues K, and through the openings L at the top of each flue. These openings are each furnished with a damper M, which can be easily regulated so as to enable the exact amount of air necessary to effect perfect combustion to enter the flue. The sliding bricks are accessible from the top of the ovens through the openings N which are fitted with easily removable plugs (fig. 3).

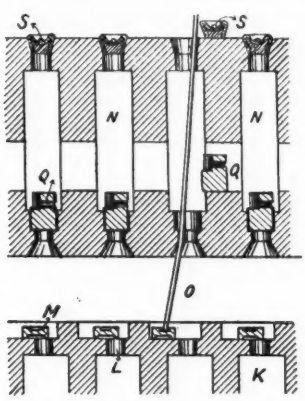


Fig. 3.—Longitudinal Section (Enlarged) through the Heating Flues.

Particular attention should be directed to the sliding bricks, and to the openings at the top of the ovens which give access to them, as these are two of the principal features of the Koppers ovens, and distinguish them from all other constructions. After passing through the openings at the top of the heating flues, the gases of combustion flow along the horizontal flue O in the direction indicated by the arrows (fig. 1), and finally pass down into the main flue P leading to the boilers. The outlet flue from each oven is furnished with a regulating damper R, by means of which the chimney draught is adjusted.

The Koppers Regenerator Oven.

This oven is designed on identical lines to the waste-heat oven, and differs only in that the air for combustion is heated to an intense degree by means of regenerator chambers, similar to those adopted in Siemens steel furnaces. The advantages of equal heating, easy means of regulating, and the facilities for inspecting the flues, which distinguish the waste-heat oven, are the same in the regenerator oven. In order to avoid the trouble and inconvenience which may be experienced through repairs having to be carried out in connection with the regenerators, which would always necessitate the shutting-down of the whole battery of ovens, an oven was designed and patented by Mr. Koppers, in which separate regenerator chambers are provided for each oven. Figs. 4, 5, and 6 are longitudinal and cross sections of the latest type of regenerator oven, of which the following are a few details: The air for combustion flows along the passage ways A, at the front and back of the ovens, and thence passes into the regene-

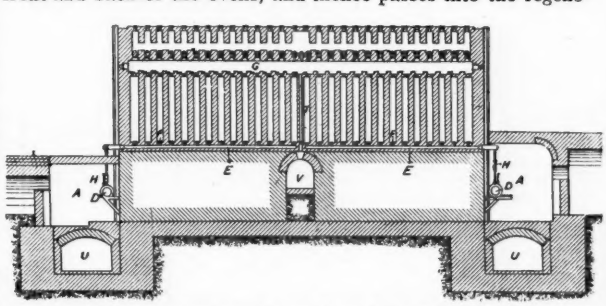


Fig. 4.—Longitudinal Section through the Heating Flues.

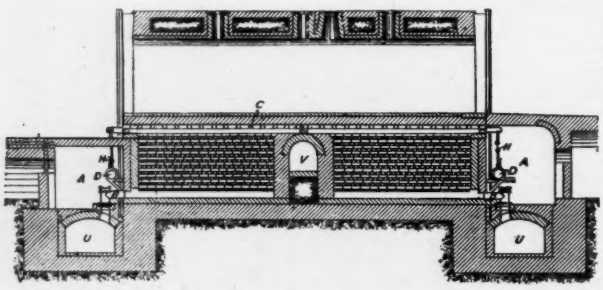


Fig. 5.—Longitudinal Section through the Oven Chamber.

rators through the inlets B. In the regenerators, the temperature of the air rises to about 1000° C. (1832° Fahr.) The highly-heated air passes out of the regenerators into the vertical heating flues through the openings C. The purified gas from the bye-product plant is returned to the ovens by the mains D, running along the whole length of the ovens on each side. Branch supply-pipes H conduct the gas into the distributing channels E, which are situated directly beneath the oven walls. Thence it passes through the gas-nozzles F into each vertical flue, where it unites with the hot air entering through the passages C previously referred to (fig. 5). A jet is thus formed on a level with the oven floor in each of the heating flues of the oven chamber.

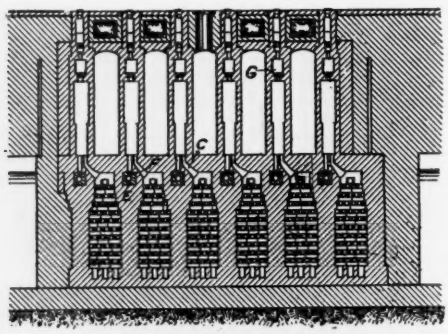


Fig. 6.—Cross Section through the Ovens.

The employment of regenerators renders it necessary to reverse the heating process after a period of time—usually about thirty minutes; and the heating flues are divided into two sections, so that combustion can take place alternately in each half of the oven wall. When the gas is burning in one half of the wall, the products of combustion pass up the flues and enter the top horizontal flue G, whence they make their way down the flues in the other half of the oven wall, and enter the regenerator through the same passages, C, by which the air is admitted to the flues when the direction of combustion is reversed. On issuing from the regenerator, the waste gases pass into the flue leading to the chimney, after giving up their heat to the chequer-work fire-brick.

The Koppers Direct-Recovery Process.

The illustration, fig. 7, is a diagrammatic representation of the Koppers direct-recovery system. The hot gas from the ovens enters the coolers B, where its temperature is reduced to about 25° C. It is then drawn by an exhauster C, by which it is delivered to the tar-extractor B. After having been freed from tar, the gas is passed into the re-heater M, where it is heated up to a temperature of about 50° to 60° C. The heated gas is then conducted along the main F to the saturator E, in which the ammonia gas is extracted by direct absorption in sulphuric acid, and is recovered in the form of sulphate. The saturator is of the totally enclosed type; and the sulphate is continuously removed therefrom by means of an ejector working either with steam or compressed air. The salt is delivered on to a collecting table, and thence into a centrifugal dryer L, where it is completely freed from mother liquor.

The products of condensation which are extracted in the cooling and tar-eliminating operations are drawn off from the condensers, tar-extractors, &c., and are conveyed into a separating tank H, where the tar and ammoniacal liquor separate owing to their different densities. The tar flows into the storage-tank I, and the liquor into the tank J. It is pumped to the ammonia still G, where the ammonia is driven off by steam and lime in the usual way. The vapours of distillation are conducted from the still, and are delivered into the main F, where they mix with the heated gas, and the whole then passes into the saturator. It is important to note that no live steam whatever is required in the Koppers process, either for distilling the liquor to liberate the ammonia, or to re-heat the gas after cooling and tar extracting. For both these purposes the exhaust steam from the engines driving the exhausters is more than sufficient.

The gas passes out of the saturator by the main K, by which it is conducted back to the ovens and other points where wanted. Where benzol is required to be recovered from the gas, it is only necessary for it to be cooled down after leaving the saturator, after which it is subjected to the usual scrubbing operations.

The sulphate produced by the above process is claimed to be far superior to that obtained by any other system, as, owing to the fact that the gas is thoroughly free from tar before entering the saturator, a perfectly white salt is invariably produced.

Recovery of Benzol.

The recovery of benzol has received considerable attention of late, owing to the fact that much refined benzol is now being used in place of petrol as fuel for motor engines. The majority of coke-oven installations now have benzol-recovery plants; but very few produce refined spirit—what is known as "crude" or "65 per cent." benzol being generally made. On all bye-product coke-oven plants in this country, the benzol can be extracted from the gas without affecting the amount of energy obtained from it when used for boiler-firing purposes, or for combustion in gas-engines, by more than about 5 to 10 per cent. The recovery of benzol from coke-oven gas is now universally effected by means of absorption in creosote oil—a product obtained in the distillation of coal tar; and the difference between the various systems on the market lies principally in the internal arrangement of the apparatus employed, and the temperature and steam pressure at which the various parts are worked.

The author closed his paper with a description of the plant employed in the production of crude and refined benzol.

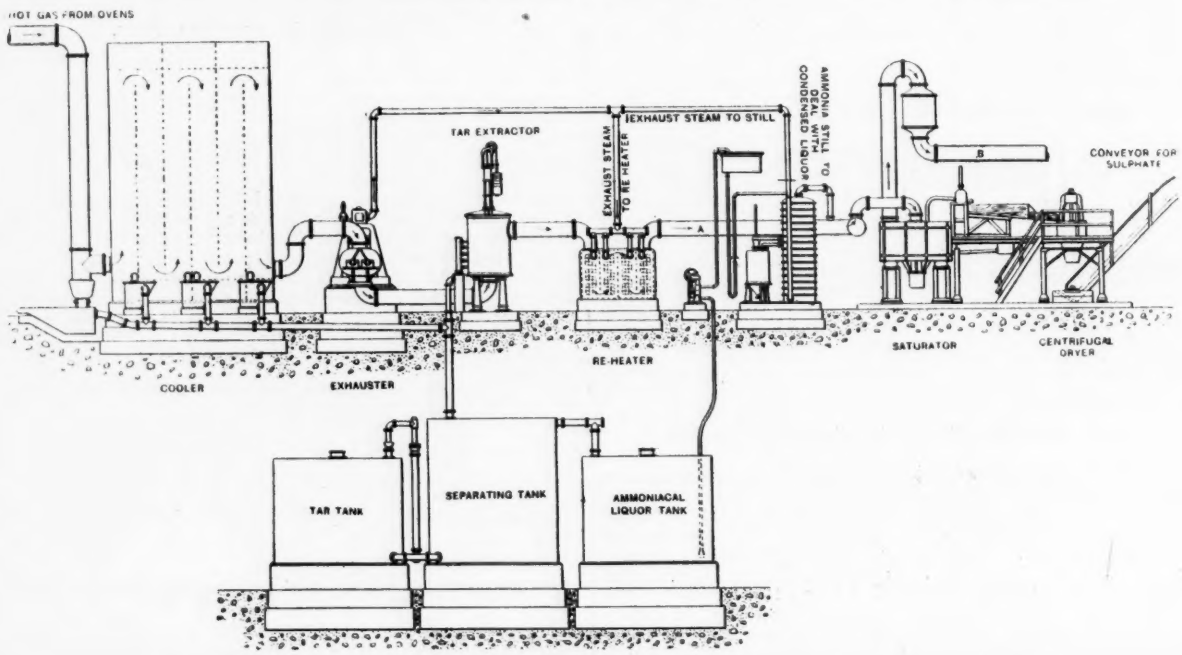


FIG. 7.—DIAGRAMMATIC SKETCH OF THE KOPPERS DIRECT-RECOVERY PROCESS FOR AMMONIA.

THE VOICE FROM BELOW.

The "Freak" Electric Table at the Ideal Home Exhibition.

THEY are funny people who look after the publicity interests of the electricity industry. The much advertised centre of attraction to La Maison Electrique at the Ideal Home Exhibition is the dining-table, which is supposed to be, if it is not always owing to little derangements of parts, electrically worked. The table is looked upon in much the same light as the fat woman in a country fair—people go to see it, have a laugh over it, and pass from the stand to other things more in consonance with their every day environment, believing that this is the chief and really only thing worth seeing at this combined effort of the Electricity Supply Publicity Committee and a dozen Metropolitan Electricity Supply Companies who are running the show. Visitors, appreciating that there must be some one below the table, look upon it as a joke upon their intelligence; and some of them wonder what has come over the business men of the electrical industry. One lady friend from the suburbs, while examining the table tells us that she was startled by hearing a gruff voice rising from below when something had apparently gone wrong with the "works." A caricaturist—who has seen more of the preparations and operative forces at work in connection with the table than would have been vouchsafed him had he been recognized, has sent for publication a rapid pen-and-ink sketch to illustrate, in one picture, what he has seen and heard, with his general impressions, concerning the table. Perhaps it is not kind of him giving vent to his knowledge and reflections in this form; but as he watched the people taking the whole thing as a huge joke, which is the very proper spirit, he could not refrain from engaging in the fun—more especially as he knew what was happening in consequence of a breakdown.

The caricaturist is justified by the half-hearted way in which the Electrical Press tries to make the best of this importation from Paris. The "Electrical Times" calls it the "freak" table, and says it attracts "large" crowds. It also asserts that the demonstrator of the device has to work at 100 per cent. load factor. The "chief demonstrator" when the table declines to act normally is seen under the table in the sketch. Our contemporary also remarks that "the impulse of the lady visitors to look under the table seems irresistible." In an editorial note upon the subject, the same contemporary observes: "The great attraction is the unique, marvellous, and mysterious electric dining-table, specially imported from Paris for the occasion at enormous expense; and this is set working every five minutes. It is a 'freak' exhibit, if you will, but it draws the crowd; and they see incidentally on their way round the 'house,' all the usual domestic applications of electricity." "Incidentally" is a very proper expression in the circumstances.

"Electrical Engineering" is caustic. It says: "The wonderful dining-table is not at all impressive, and there is nothing to convince the spectator that it is not worked by hand, and, as a finale to the visitor's tour through the stand, leaves him confused as to which are the real benefits that electricity can afford in his home." The "Electrical Review" only looks upon the table as an advertising medium, but an impracticable thing for the house; and in a little picturesque effort, our contemporary says: "We come with hurrying feet, to offer our congratulations to them [the Electricity Publicity Committee] upon this part of the display organized in La Maison Electrique." The Committee will, we feel sure, duly appreciate the additional speed of our contemporary's feet in laying its tribute before them. They sadly wan even such encouragement as this. For our electrical friends, it is a pity that the caricaturist learned about a breakdown, and that things beneath the table were not at the time of his visit in their designed condition.

(AUTOMATIC) ONE MAN "ELECTRICAL" POWER (THE UNDERGROUND EXHIBIT, PUBLIC NOT ADMITTED.)
SPECIAL EXIT BY ORDER OF THE L·C·C
INSTRUCTION TELEPHONE
Begorra! is it the first wan or the last wan thats ringing!
1 RING For Light
2 RINGS For Service
1 RING For Lift to go down.

THE ELECTRIC DINING-TABLE IN LA MAISON ELECTRIQUE.

[The caricaturist explains: Owing to the breakdown of the electrical apparatus, the service of the dining-table had to be worked by a man in a chamber below. A signalling code was arranged as follows: Switch on the light, one ring; serve the dinner, two rings; remove service, one ring.]

The fifth annual meeting of the Institution of Municipal Engineers will be held on the 7th prox. A special general meeting is arranged for the same day, to consider certain amendments of, and additions to, the bye-laws. One proposal relates to the creation of a mutual aid and defence fund, contributions to which are to be compulsory on all corporate members and students except those resident abroad and in the Colonies (who will be exempt also from participation in the fund).

CORRESPONDENCE.

The National Gas Congress and Exhibition.

SIR,—The following speaks for itself. Others please copy.

Dear Mr. Goodenough,—I have seen your letter in this week's issue of the "JOURNAL OF GAS LIGHTING," and note that you could still profitably spend much more money than you have already received in the National Gas Exhibition. I have pleasure in enclosing small cheque, for the sum of £10 10s., which I trust you will accept on behalf of your Committee. I am afraid this is rather of the "Widow's Mite" order; but then, as you know, my firm is still very young.—Yours faithfully,

(Signed) HERBERT N. CLARK,
Sole representative in Great Britain for Humphrey Lamps and Gas Goods, 28, Brooke Street, E.C.

F. W. GOODENOUGH, Chairman of the Executive Committee of the National Gas Exhibition.

Coke-Heated Water-Boilers.

SIR,—We have noticed that, in your description of Sept. 30 of the various goods on show at the National Gas Exhibition, very full particulars are given of the coke-heated water-boilers shown by the Phœnix Supply Company, and that on Oct. 7 correction was made with reference to the matter given the previous week.

In reading through the description, it seems that another mistake has been made, as features are ascribed to the "Gasco" boiler which, we think, must have been, in error, taken from a description of our "Kingsland" boiler. You say: "In addition to the design shown, the boiler may be made with a hot closet or plate warmer on top, and an open front to show a bright fire to the kitchen, while, when the front plate is let down, irons may be heated before the fire."

We think, if you look at the "Gasco" boiler again, you will see that neither of these features is applicable to it—in fact, they are for the first time embodied in boilers of this description to carry out special ideas of our own.

TILLEY BROS.

53, *Kingsland Road, N.W., Oct.* 14, 1913.

[We are not sorry to receive this letter from Messrs. Tilley Bros., as it gives an opportunity for setting before our readers the matter of their claim to a prior embodying of the special features referred to in coke-heated water-boiler equipment. But we must remove any suggestion of our having transferred information from any communication received from Messrs. Tilley Bros. to the notice of the Phœnix Company's goods. The Phœnix Company were asked to inform us as to the special features of their boilers at the exhibition; and the words of which complaint is made appear in the written communication received from them. Therefore, they are responsible for the statement that their boiler "may be made" with the auxiliary features alluded to. And so the matter really rests between Messrs. Tilley Bros. and the Phœnix Company. Still the point does not appear to matter much, if the Phœnix Company are claiming to be able to do something which they cannot fulfil. Nevertheless, Messrs. Tilley Bros.' claim in the matter will not be overlooked by our readers.—ED. J.G.L.]

Alliance and Dublin Gas Company.

SIR,—In answer to your correspondent "Nonulus," I beg to say that I was not aware that any "fray" was in progress, *re* the above, but simply to state as clearly as possible one's own view on the matter—hoping thus to be able to prove beneficial to everyone concerned. I certainly do not see that any pity need be expressed by "Nonulus," as I have simply taken up the question voiced in his letter which appealed to me more particularly.

I supplied certain figures in my last letter, dated Oct. 3, which I trust "Nonulus" has found correct. "Nonulus" is right in his letter of Oct. 9, showing that the quantity of gas sold under section 4 of the gas sales for the December 1911 half year are stated as follows:—

747,708,350 cubic feet = £87,716 16s. 10d.

And this, so far as the quantity is concerned, is evidently a clerical error in the balance-sheet, as this quantity of gas includes that used on the works, &c., for the period named, as shown under section 12 of the same balance-sheet, as follows:—

Gas sold, six months to Dec. 31, 1911 . .	735,838,000	cubic feet
Gas used on works, do. . .	11,870,000	,,
Total quantity accounted for	747,708,000	cubic feet

There is thus put in as gas sales for the above six months in section 4 an amount of 11,870,000 cubic feet used on the works, &c. This, however, does not affect the financial results one iota.

In his concluding remarks, I notice "Nonulus" advises me to join what he terms "the band of critics." I should never dare to advise "Nonulus" what either to do or not to do; and I feel sure he will leave me with an equally free will in the matter.

R. V. S. HOUGHTON.

Lane House, Helmshore, Lancs., Oct. 17, 1913.

A Justifiable "Growl."

SIR,—Some time ago I made application, in reply to an advertisement in your columns, for the post of assistant to a gas engineer. I have had no acknowledgment, neither has any notice as to the appointment appeared in your columns. This treatment appears to be, from my experience, more the rule than the exception. Why is it that gas engineers, so courteous in other ways, fail in this respect?

ASSISTANT.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Half-Yearly Report.

At the Half-Yearly General Meeting of the Association on the 4th prox. the Directors will present the following report, which is accompanied by the accounts, on the results of the Association's operations in the six months ended the 30th of June.

The profit of the half year was higher by £38,470 9s. 10d. than that of the first half of 1912, and amounted to £286,479 1s. 11d., which, together with the sum of £18,568 2s. 3d. brought forward from the previous half year's account, makes £305,047 4s. 2d. available for appropriation, as compared with a profit of £248,008 12s. 1d. and an available total of £306,908 3s. 9d. on the 30th of June, 1912. The Directors recommend a dividend for the half year ended the 30th of June, 1913, of 4½ per cent., less income-tax.

The total output of gas in the towns supplied by the Association increased in the first half of 1913 by 4·13 per cent., or by upwards of 220 million cubic feet; and on June 30, 1913, the number of consumers was greater by 7·73 per cent. than at the close of the corresponding half of 1912.

The total number of meters in use at the close of the first half of 1913 was 537,639, of which 167,896, or 31·23 per cent., were prepayment meters. At the end of June, 1912, the total number of meters in use was 508,764, of which 149,836, or 29·45 per cent., were prepayment meters.

Seventy-one miles of new mains were laid in the half year under review; making a total length on the 30th of June of 2321 miles.

The plant and mains were maintained in their usual efficient condition.

The quantity of coal carbonized in the half year was 473,739 metric tons (or 9000 tons more than in the first half of 1912), at an average gross cost per ton delivered on to the works of 17s. 7·32d. per ton, or 2·2d. less than in the corresponding half year.

The value of coke was higher than in the first half of 1912; and the values of tar and ammonia also showed improvement.

The Directors have to report the sale, at a fair price, of the concession and gas-works at Cernay, a small town in Alsace, the administration of which had for various reasons become inconvenient and uneconomical.

A contract securing for the Association a monopoly of the supply of gas until the year 1948 was concluded with the commune of Vremde, near Antwerp; and the exclusive contract for the supply of gas in the commune of Teltow, near Berlin, was prolonged for ten years, until 1966. Monopolies of the supply of gas and electricity until the year 1948 were obtained in the communes of Beersel, Buysinghen, and Tourneppe, situated to the south-west of Brussels; and exclusive contracts for the supply of gas until 1950 were concluded with the communes of Gehrden, Langenforth, Misburg, and Anderten, near Hanover.

At Antwerp, the water-gas plant at Hoboken, referred to in the last report, was practically completed; and the construction of a further installation of Dessau vertical retorts on the Berchem works, in replacement of old horizontal retorts, was proceeded with.

At Berlin, progress was made with the erection of a trial furnace on the Glover-West vertical retort system on the Mariendorf works.

At Brussels, a commencement was made with the erection of an electrical coal-handling plant at Forest; and the erection of a new 4000 K.W. turbo-dynamo on the Association's electricity works at Droogenbosch was put in hand. The Droogenbosch works, which are capable of considerable extension, are at present supplying electricity in eleven suburban districts of Brussels.

DANISH GAS COMPANY.

Annual Report—Increased Dividend.

At the annual meeting of the Danish Gas Company to be held to-day, the Directors will report that the net revenue for the year to the 30th of June last was £83,234; being an increase of £5753 over that of the previous year. Adding the amount brought forward, the total credit to the profit and loss account is £134,547. After charging the debenture interest and loss on exchange, and setting aside £15,000 to the reserve and redemption account, there remains £108,577 available for distribution. An interim dividend of 2½ per cent. on the preference shares and 4 per cent. on the ordinary shares has already been paid; and the Directors now recommend a dividend of 2½ per cent. on the former and 6 per cent. on the latter shares, both free of income-tax, with the addition of a bonus of 2 per cent., free of income-tax, on the ordinary shares. These dividends and bonus will amount to £50,500, and will leave a balance of £58,077 to be carried forward.

The amount charged to capital account last year, for additional lands, buildings, apparatus, mains, &c., is £57,966. The expenditure was principally at Flensburg, Strandvei, Frederiksberg, and the new district of St. Hans referred to in the last report. A supplementary contract has been arranged with the authorities at Odense, whereby the present concession is extended to Jan. 1, 1954; subject, however, to the authorities having the right to take over the works in 1945 and 1950 on certain terms.

The Directors conclude by expressing their deep regret at reporting the death, in March last, of Mr. J. R. Cridland, for forty-four years the Company's General Manager in Denmark. They place on record their sense of the debt the Company are under to their late friend, for the able, devoted, and successful services he rendered during this long period. Mr. A. W. Edwards, who has been the Company's Chief Engineer during the past ten years, has now been appointed General

Manager in Denmark; and Mr. R. L. Cridland, a son of the late Mr. Cridland, has been made chief of the clerical staff.

Accompanying the Directors' report is that of Mr. Edwards, which furnishes the following particulars. The total gas consumption in the year was 1,099,398,000 cubic feet, against 1,076,867,000 cubic feet in 1911-12; showing an increase of 22,531,000 cubic feet, or 2·1 per cent. The consumption is now very nearly as large as it was before the Company lost the Randers and Aalborg stations. At Flensburg a new gasholder of 700,000 cubic feet capacity has been erected and taken into use. The new district, St. Hans, is now being supplied with gas from the Company's works at Odense. The new washer at Elsinor has been fixed. The new retort-house, with vertical retorts, at Strandvei, has been completed. The new boiler-house has been built, and also a new dwelling for the Manager. The extension of the washer plant at Frederiksberg has been carried out. The tank for the new three-lift gasholder, of a million cubic feet capacity, has been completed; and the gasholder will be finished before the coming winter. Lectures and demonstrations of the uses of gas have been held at Ribnitz, and prepayment meters introduced. The consumption of gas is consequently increasing rapidly. The retort-house at this station is being extended, and an enlargement of the works generally will be necessary next year. The prices for coke, tar, and ammonia have been satisfactory; and there is a good demand for the Company's bye-products. All necessary alterations and repairs have been carried out or are making good progress, and the stations will be in good working order for the winter.

END OF THE STOCKPORT GAS WORKERS' STRIKE.

Terms of Settlement.

In accordance with the intimation given in the telegram from our Manchester correspondent which appeared in the "JOURNAL" last Tuesday, the men employed at the Stockport Corporation gas-works, who came out on strike on the 26th ult., resumed work that day, after being idle for more than a fortnight. Terms of settlement were arranged the previous Saturday evening; and the only difference then existing was with reference to the reinstatement of the men in the other Corporation departments who struck in sympathy with the gas workers. The Corporation Committees have, however, arranged to take on these men as soon as possible, and most of them are at works The gas supply has now reached its normal condition. The public lamp. were lighted on Wednesday night for the first time for upwards of a fortnight, and on Friday the doubling mills were able to start work, and between 5000 and 6000 operatives, who had been idle for nearly three weeks, found employment again.

The following are the terms of settlement:

1.—An expert on gas-works, to be agreed upon between the Chairman of the Gas Committee and ——— on behalf of the employees, to be appointed by the Committee to report upon the conditions and arrangements of the plant at the retort-house, and as to what, if any, improvements ought reasonably to be made therein. The Gas Committee will forthwith carry out the improvements so recommended, so far as they are practicable.

2.—If the representatives of the men who are parties to the agreement show to the Gas Committee that in towns comparable with Stockport better wages are paid to the employees of the Gas Committees of those towns than are paid by the Stockport Gas Committee to their employees, two practical persons shall be appointed, one by the Committee and one by the men, to examine and adjust the wages paid by the Stockport Committee, so as to bring such wages, so far as is practicable, into conformity with the towns adopted for comparison.

3.—The Gas Committee to take back into their employment all the workmen now on strike, and that they be reinstated as soon as possible, without any penalty being imposed upon them, into the positions they occupied before the strike; and the men undertake to give satisfactory service in all respects, including obedience to the instructions of the superintendent and foremen.

4.—It is distinctly understood and agreed that none of the employees of the Gas Committee who are now working at the gas-works shall be displaced by reason of this settlement, nor shall such employees be in any respect interfered with by the employees now on strike, nor shall the men now on strike be in any respect interfered with by the men now working.

5.—Any complaints which the employees of the Gas Committee, or any of them, shall desire to make, must be laid with the Gas Engineer in writing. The Gas Engineer will then investigate and deal with the same, giving his decision in writing.

PRICE OF GAS IN CARLISLE.

Reduction with the New Year.

At the Meeting of the Carlisle City Council last Tuesday, the subject of a proposed reduction in the price of gas was under consideration.

Mr. CROWDER, in moving the confirmation of the several resolutions connected with the Finance Committee, said he might mention that the Finance and Gas Committee Sub-Committees met on the 16th ult., and, after giving very careful consideration to the question of a reduction in the price of gas, decided to recommend that the charge be lowered to 2s. per 1000 cubic feet as and from the 1st of January next to all consumers.

Mr. WHITE, in seconding the motion, said the proposal meant a reduction of 3d. to the ordinary consumers and of 6d. to those using prepayment meters. This involved a loss of revenue annually of about £5000; and as he saw the Lighting Committee were taking action with regard to the price charged for public lighting, whatever reduction might be made would have to be added to the £5000. The policy was certainly heroic; but they hoped—and he thought they were justified in hoping—that coming events would justify the position the Joint Committee had taken up. The only difference of opinion was as to the time at which the reduction should come into force; but a large majority of the Joint Committee favoured Jan. 1, 1914. One of the chief reasons for doing so was that there were 6000 slot-meters in use in Carlisle, and everyone of them would require to have the mechanism altered to suit the new price.

Mr. CREIGHTON moved, as an amendment, that the reduction take effect from the 1st of July last instead of from Jan. 1 next. He said that if the reduction took place from July it would cost the Committee £3400 for the nine months of the year, while on a full year's working it would mean a loss of £4500; and if the profits remained the same as last year, they would fall from £8600 to £5200. He thought it would be the opinion of the Council that if the profits could be kept at £5200 it would be a good substantial amount for the relief of the rates at the expense of the gas consumers.

Mr. LOWTHIAN seconded the amendment.

On being put, however, it was lost, and the Committee's recommendation was agreed to.

THE NEW VERTICAL RETORTS AT NOTTINGHAM.

Although fixed for a later date than was originally contemplated, the opening of the new installation of Glover-West vertical retorts at the Radford depôt of the Nottingham Corporation is now not to be long delayed. Difficulties in regard to the belated delivery of materials, consequent upon labour troubles in Northern and other centres, has rendered impossible the fulfilment of the contract by the period at first designed, while some formidable and unexpected obstacles upon the site itself have also had to be surmounted; the latter being represented mainly by an offshoot of the River Leen, which was encountered beneath the position marked out for one of the benches—the establishment of a ferro-concrete foundation of grid-iron formation being thereby rendered necessary. The utilization of the old retort-house, which was warped and not square, has likewise proved to be not an unmixed advantage. But these and some other difficulties have now been negotiated; the walls of the structure having been raised by many feet. The close proximity of the works to the Midland Railway, upon which the main-line trains to the North are run out of Nottingham through the Erewash Valley, is a condition necessarily advantageous to economical and efficient working. The receiving hoppers and other apparatus permit at present of 200 tons of coal being dealt with daily; the design being such as to allow of considerable expansion in view of contingencies. The contract with West's Gas Improvement Company, of Manchester, has been for the installation of 48 retorts arranged in six beds of eight; but the present expenditure (approximately of £26,000) is, should experience warrant it, regarded only as a moiety of a more comprehensive scheme of which Radford—hitherto an auxiliary to the larger sources of supply at Basford and London Road—will be the centre.

The formal opening has been fixed for Friday, the 31st of October, and invitations to attend will be sent out to the whole of the members of the Council, the great majority of whom will have an opportunity for the first time of inspecting the completed works.

FERMOY GAS COMPANY'S AFFAIRS.

An Appeal from the Decision of the Petty Sessions.

In connection with the action of the Fermoy Urban District Council against the Fermoy Gas Company, reported in the "JOURNAL" last week, in regard to alleged default in filing a return under the Gas-Works Clauses Act, the Council, at their last meeting, discussed the report of their Solicitor, showing that the Court of Petty Sessions had dismissed the summons, without prejudice and without costs.

The CLERK said, so far as the hearing went, it was evident that the gas consumers were paying the dividends for the entire Company.

The CHAIRMAN (Mr. M. Kelleher) remarked that the Company seemed to have it all their own way.

Mr. TROY said, of course, they had a right of appeal; but Counsel was of opinion that it would be useless to proceed. The state of things disclosed at the hearing was, in his opinion, extraordinary. It was claimed that there were two Companies—the first being the one that existed before the Provisional Order was obtained, and called the "incorporated Company;" the second being the one formed after getting the Order, which was called the "statutory Company." The Company had no right to sell coal as the statutory Company, but they had as the incorporated Company. But the most extraordinary thing was in regard to fittings. These were bought with money received by the gas undertaking. If they were rented, the profits were credited to the gas undertaking; but if they were sold outright, the cost only was credited to the undertaking of the statutory Company, and the profits were credited to the other.

The CHAIRMAN said that this was clearly not a straight system of management.

Mr. TROY suggested that the facts as disclosed in Court should be laid before the Parliamentary Agents (Messrs. Lees and Co.).

Mr. J. SHEEHAN expressed regret that they were advised against an appeal; nevertheless he would move that they should lodge one. No evidence of a documentary nature was adduced by the Company, except one document, which was refused to the Council's legal advisers on the plea that it was a private communication and for private information only. In the Irish Stock Office there was only one Company registered, and that was the only Company in which they were interested. If the Gas Company were allowed to think they could go on in the way mentioned, the ambit of their undertaking would be enlarged, and worked by the same men and the same staff as the gas undertaking. Mr. Anderson, who was so largely interested in the undertaking as shareholder, Director, and Secretary, might in future embark in any undertaking with the capital of the Company, and make immense profits.

Mr. TROY said it seemed to him that Mr. Anderson was very foolish in cutting down his profits. If the Council thought of purchasing the

property, he was putting himself in a dangerous position, unless he was anxious to get rid of the works altogether.

Mr. SHEEHAN then proposed that Mr. Troy be authorized to lodge an appeal and take the advice of the Parliamentary Agents on the matter. If they thought the Company were entitled to act as they were doing, the appeal could be withdrawn.

Mr. DALY seconded the motion.

An amendment to the effect that there should be no appeal was defeated, and the resolution carried by a majority of three.

PUBLIC LIGHTING AT RUISLIP-NORTHWOOD (MID.).

How Not to Do It.

The following article on the public lighting of Ruislip-Northwood has appeared in the "Sanitary Record and Municipal Engineering."

There are corporations and district councils who carry out the duties imposed upon them with such evident fairness, freedom from partiality or bias, and with such apparent honesty of purpose for the ratepayers, that the latter give them their confidence and appreciation by maintaining a silent reticence, which is an Englishman's way of showing his gratitude to public representatives who gratuitously sacrifice much time and personal convenience in the interests of their fellow-citizens. There is, however, another type of council which fails to earn the confidence of the constituency, and its actions are viewed with suspicion and mistrust. Such a one, we learn, is that of the Ruislip-Northwood Urban District Council, in Middlesex, news of the doings of which reach us from various sources. There appears to be some reason for the prevalence of dubiety which exists in this little town of 7000 inhabitants, which has acquired, by the way, some reputation from its efforts to become recognized as one of the first to go in for development on Garden City lines. Among the Council's latest attempts at enterprise is that of assaying the task of public street lighting; for at the present moment the inhabitants have to walk in darkness.

It appears that in the urban district of Ruislip-Northwood there are two undertakings for the supply of artificial light—viz., the Pinner Gas Company and the Northwood Electric Light and Power Company, Limited, in the latter of which certain councillors and a prominent official have much interest financially and otherwise. This circumstance is not detrimental to the individuals concerned, though it may be otherwise for the Company, especially when a contract for public street lighting comes up for preparation and consideration, as was the case recently. And it is well, in the interests of local government, the purity of which it is our constant endeavour to guard, that we draw attention to the eccentricities of this Ruislip-Northwood Council.

This body recently directed that tenders should be invited on a specification for the lighting of the public lamps proposed to be fixed in the roads in Northwood. It is singular, we are bound to point out, that the Council should have been "jockeyed" into the insertion in the specification, which is before us as we write, of a clause as follows: "The gas-burners must be of at least 80-candle power, and the electric lamps of at least 50-candle power. These candle powers will have to be maintained throughout the lighting season." This specification is dated June 13, 1913; and at the meeting of the Council held on the 13th of July following the report of the Highways Committee—the Chairman of which, we are informed, has considerable interest in the Electric Light Company—was presented. This Committee submitted that "if electric lamps were decided upon, it was suggested metallic filament lamps of 50-candle power would be sufficient; if gas, incandescent burners of 80-candle power would be required, owing to the more rapid deterioration of mantles." And then this enlightened Committee recommended accepting the tender of the Electric Light Company, which amounted to £203 2s. 6d. (or 32s. 6d. per lamp for 50-candle power), as being better than that of the Gas Company at £196 17s. 6d. (or 31s. 6d. per lamp for 80-candle power), for, as the Chairman was at pains to explain, the tenders were nearly the same, and "there was practically no difference as regarded cost. It was therefore purely a question of personal feeling or sentiment"—a statement which is, of course, contrary to fact.

To those upon whose brow is not branded, as would appear to be the case with Ruislip-Northwood councillors, the word "Simplicissimus," the proceedings appear to be almost incredible, and a travesty on local government. The specification, as we noticed, provides that "the gas-burners are to be of 80-candle power, and are to be maintained at this candle power throughout the season." Yet the Council is cajoled (for what ulterior motive it is not for us to say here) into believing that 50-candle power electric light is equal to 80-candle power gas; and they let the contract to the Elecric Light Company on this basis. Now, the tender of the Gas Company for lamps of 50-candle power was £1 6s. 6d. per lamp; and as the undertakers were bound to keep the light at this standard subject to a penalty, this should have been compared with the tender of £1 12s. 6d. per lamp for 50-candle power lamps of the Electric Light Company. In other words, the Gas Company offered to supply the same candle power lamp for 125 lamps at 6s. per lamp less than the Electric Light Company. The Council have also been generous enough, it appears, to give to the Electric Light Company the providing of the street-lamp columns, lanterns, fittings, &c., without competition, and in contravention of section 174 of the Public Health Act, 1875. If such transactions are described by ugly names, the councils who are concerned with them must incur the odium. It is regrettable that they should occur, for they are used adversely against all councils alike.

It is fortunate, however, that the Local Government Board is controlled by a President whose strenuous life is devoted, *inter alia*, to the suppression of irregularities and of jobbery in local government matters; and we are confident the Department will investigate, as we have had to investigate, the unpleasant facts in connection with this and other matters appertaining to this Council.

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	Radiation Result.	Ratio.	Gain.
1912 Fire with 1912 Fuel	51·0	100	—
1912 „ „ 1913 Fuel	59·7	117	17
1913 „ „ 1913 Fuel	73·1	143	43

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GAS-METER RENTS AT NOTTINGHAM.

In the course of the municipal campaign now in progress at Nottingham, considerable prominence is being given by candidates to the vexed question of the abolition of gas-meter rents, which, among the large corporations, Nottingham is now almost the last to be found enforcing. It is urged that, having regard to the handsome profits accruing from the undertaking last year, when £39,000 was voted in relief of the district rate, the Corporation can very well afford to do without the £5000 or £6000 annually which these rents represent; the contention being strengthened by the fact that in numberless cases, upon the present basis of the charges, the meters have been paid for by users over and over again. The entire abolition of the rents is apparently a matter which cannot be long delayed, though a temporizing policy has for a time found acceptance, in view of the declaration of the Chairman of the Gas Committee that at a period of abnormally high prices of coal it will be as well to wait, at all events until the close of the present financial year, before coming to any decision. In the innumerable speeches to which ratepayers are invited to listen at this juncture, particular notice is also being directed to the disparity of prices in Nottingham for gas received through prepayment and ordinary meters; the suggestion being that the consumers using the former meters are charged at too high a figure. But here again it is recognized by those who possess an adequate knowledge of matters, that it will be as well to proceed with greater caution than is manifested by many who are in quest of popular election cries.

OBTAINING ORDERS BY MISLEADING STATEMENTS.

In connection with the letter which appeared in our "Correspondence" columns last week from Mr. C. B. Tully, attention has been directed to a case tried at the Market Harborough County Court on the 6th inst. For a report of the case, which is reproduced below, we are indebted to the "Ironmonger" of the 11th inst.

THE FOREIGN STEEL TRICKSTERS AGAIN.

At the Market Harborough County Court on Oct. 6, the Stellorite Company, of Rue de la Victoire, Paris, sued Mr. W. Allsop, of St. Mary's Road, Market Harborough, for £7 14s. 8d., Thomas Hickman and Sons, of Market Harborough, for £7 14s. 8d., and the Market Harborough Brick and Tile Company for £5 5s. 4d., alleged to be due for steel supplied.

Thomas Heyman, traveller for complainants, stated he had received orders from each of the defendants for bars of stellorite—a steel for pointing picks and chisels. The lengths ordered were "about four metres" in two cases and "about three metres" in the third.

Frank Hickman, a partner in the firm of Hickman and Sons, said he gave a small order on the distinct understanding that the cost would not exceed from five to seven shillings. Witness did not know what a metre meant, and he did not ask, as the cost was more important to him than the length.

Chas. M. Allsop, working foreman for Mr. W. Allsop, said when he wrote the word metres he asked what it was going to cost, and the traveller said four or five shillings. When the bar came, to his surprise it was 13 or 14 feet long.

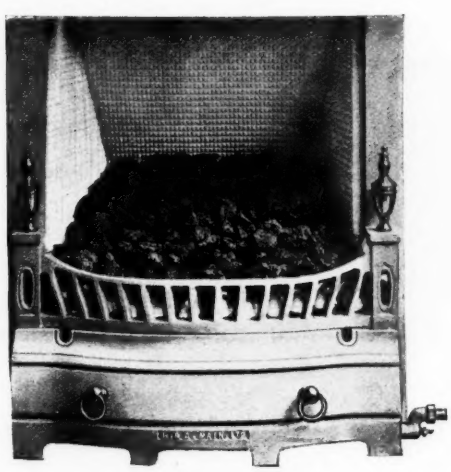
J. H. Smith, Manager of the Brick and Tile Company, said the traveller told him he was introducing a new steel into this country. Witness thought it was a good thing, and felt inclined to give him an order. Witness knew that a metre was a yard or thereabouts, and he gave an order for half a bar for picks and half a bar for chisels. Instead, about 12 feet of each came. The traveller told him the cost would be a few shillings, and witness expected that he was meaning an expenditure of under a sovereign.

The Judge said that the transaction could not possibly stand. These orders were obtained under a mistake, the effect of which made it impossible to enforce them. If the vendor sent more than was ordered the buyer was entitled to reject the whole lot. It was unfortunate that the traveller when dealing with English people should have used a foreign measure. Allsop and Hickman did not know what a metre was, and in their cases everything turned on that, because otherwise they had every reason to suppose they were ordering a small quantity. Smith admitted that he knew what a metre was; and in his case everything turned on the form of the order. Plaintiffs sent double what Smith ordered, and he was not bound to take it. Judgment would be for the defendants. But he thought there had been a great deal of carelessness on the side of the defendants in signing orders in a foreign tongue, and in very ambiguous form; and he should not, therefore, allow costs.

CORROSION OF STEEL WATER-MAINS.

In the "JOURNAL" for the 7th inst. (p. 42), we noticed a communication received from the Manager of the British Mannesmann Tube Company, Limited, on the subject of the destruction of the Coolgardie steel water-main by corrosion. The subject is dealt with in a letter, signed "Water Engineer," which appeared in "Engineering" for the 10th inst. After pointing out that the full report of a Commission, consisting of the late Mr. G. F. Deacon, Dr. Otto Hehner, Sir William Ramsay, and Sir Alexander Binnie, who investigated this matter, was first given in the French periodical "L'Eau," and that its material points were translated for the "JOURNAL," and appeared in the number for Jan. 16, 1912, the writer said: "The Manager of the Mannesmann Tube Company states in his letter, 'the main in question was laid without any protective covering.' The report above referred to states that the external corrosion 'appeared to be due to the deterioration of

The Function of the "St. Nicholas."



The primary function of the "St. Nicholas" is to convert a coal grate into a gas fire.

While this function is satisfactorily performed, the genial glow and sentimental associations of the coal fire are retained.

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the protective covering of the pipes.' What has the Manager of the Mannesmann Tube Company to state in reply to this? The Commission also reported, as to internal corrosion, the following as their opinion: 'The results of the experiments led the Commission to attribute to the oxygen in solution (which all waters contain) the corrosive action upon iron and steel, which are not constituted of pure metal, but contain, in a state of combination, carbon, manganese, and phosphorous. These elements not being uniformly distributed in the mass of metal, the latter may be considered as being formed of a large number of minute galvanic elements.' London water was used in the experiments, and the Commission state: 'Direct experiments showed, however, that, in comparison with London water, which contains 8·9 parts of combined carbonic acid, the relative activity of Coolgardie water is only in the proportion of 1·38 : 1. The Manager of the Tube Company in his letter only deals with external corrosion. Will he state the effect that free oxygen, contained in all waters, has on the interior of Mannesmann steel tubes?"

We have received the following letter on the above subject from the General Manager of the Holwell Iron Company, Mr. Thomas Sarson:

I call your attention to the paragraph on page 42 of your issue for Oct. 7, "Steel Tubes for Conveying Water," and must say I am rather amazed at the misleading statement you have inserted. It is notorious that it was precisely the unfortunate condition of the interior of the Coolgardie steel pipes that was, and is still, causing so much anxiety. The special reports of experts clearly set forth that corrosion and incrustation were produced to an alarming extent in all of the thirteen sections, and in seven of them to such a degree that the effective discharge was reduced 23, 24, 29, 31, 40, 44, and 53 per cent. respectively, and that in the short space of only five years. External protection is a matter more easily dealt with; but there is the difference that, when the covering does give way, cast iron, by its very constitution, will for a long time resist the ravages of rust, while steel will be attacked and destroyed with the utmost rapidity.

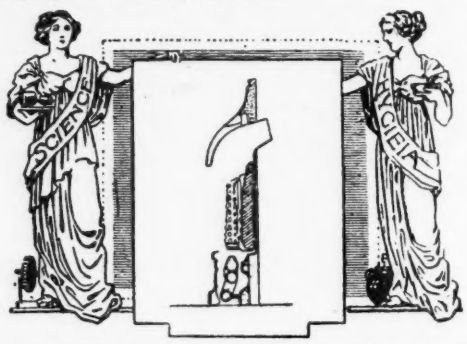
We can only say that the "misleading statement" referred to by our correspondent was contained in a letter received from the Manager of the British Mannesmann Tube Company, Limited; and it will be seen, from the remarks of "Water Engineer" quoted above, that the letter was also sent to "Engineering."

Cost of the Banbridge Electric Lighting Inquiry.—The cost to the town of Banbridge of the recent Board of Trade inquiry into an application for authority to proceed with an electric lighting scheme (which, it may be remembered, was refused), is shown, by the bills of costs presented to the Urban District Council, to have been £660 12s. 8d., and the amount outstanding is given as £206 12s. 6d.

DAVIS GAS-STOVE COMPANY, LIMITED.

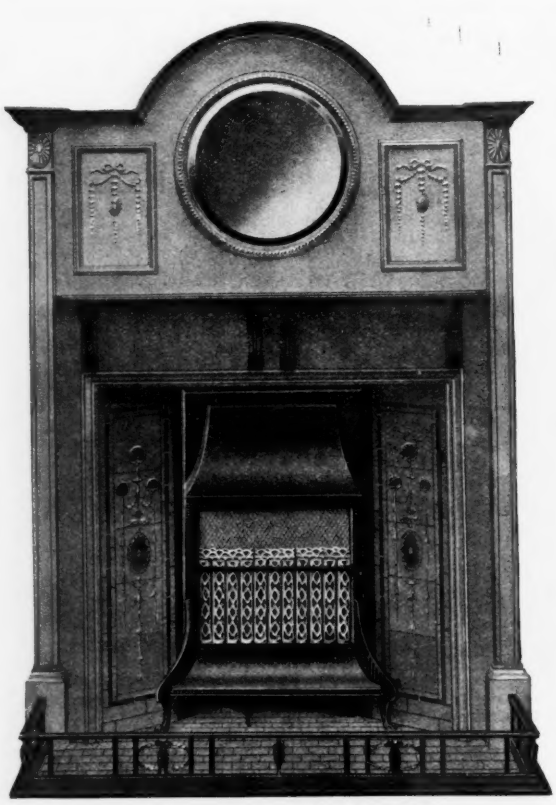
Complimentary Dinner to the Selling Staff.

The members of the selling staff of the Davis Gas-Stove Company spent an interesting day last Thursday in making an organized tour of the National Gas Exhibition. As a fitting conclusion, about forty of the staff responded to the invitation of the Directors to be present at an informal dinner which was held at the Trocadero Restaurant in the evening. Mr. Cyril Davis occupied the chair, supported by his brother, Mr. H. N. Davis. In addition to the members of the staff, the Company had the pleasure of welcoming as guests one or two visitors from prominent English and Foreign gas undertakings, including Mr. Oscar H. Fogg, of New York, Dr. Simon St. Just, of the Paris Gas Company, and M. Levy, his assistant.



SCIENTIFIC CONSTRUCTION YIELDS PERFECT HYGIENIC AND RADIANT EFFICIENCY

The front page of the *menu* card, which we reproduce, gave some indication of the main purpose of the gathering—viz., to celebrate the phenomenal success of the hygienic gas-fire campaign which the Company have been prosecuting with so much energy. Co-operation between the departments and individuals, frequently mentioned during the evening, was referred to as the foundation stone upon which this success had been built up. A like spirit was apparent throughout the whole of the proceedings—the feeling of understanding between the Directors and the staff being complete. Mr. Cyril Davis's vivacity and good fellowship seemed contagious, and the proceedings went with a swing from first to last. The dinner proper was followed by an impromptu variety entertainment, consisting of contributions by various members of the staff, which were received with unstinted approval.



The "Louis" in front of Coal Fire Grate.

Efficiency

The word "Efficiency" as applied to a modern Gasfire conveys a meaning of importance to Gas Undertakings who are right in providing heaters to give satisfactory heating results. But to appreciably increase the number of Gasfire users you must have something more than Efficiency.

Richmond
GAS STOVE & METER CO. LTD.

Gasfire Specialists,

132, Queen Victoria St., London, E.C.

WORKS: WARRINGTON.

ELECTRIC CABLE TROUBLES.

Explosion near the Strand—The Cable Question at Hebburn-on-Tyne.

Shortly before seven o'clock last Sunday evening, an explosion occurred in a manhole at the foot of Norfolk Street, Strand; and for upwards of half-an-hour there was a spectacular display of flames, with frequent explosions, showers of *débris*, and the hissing and sputtering of electric wires. The first explosion, which, it is believed, was due to the fusing of an electric cable, which severed the gas-main, blew up the manhole, and with it part of the pavement. Almost immediately another manhole on the other side of the road burst into flame, so close to a block of offices that when the firemen arrived they had to pour water on the building to prevent it from catching fire. The wind fanned the flames from the manhole across the street, and the manhole which first exploded burnt like a miniature volcano. At first there were several sharp explosions at regular intervals, and lumps of concrete were thrown up, while vivid flashes of blue flame lighted up the neighbourhood. The hissing and sputtering explosions and flames made up a most striking scene; and a large crowd assembled. The firemen opened other manholes in the neighbourhood as safety-valves, but were unable to approach closely to the first hole, which gave a great deal of trouble. Eventually they managed to get several bagfuls of sand down. The flames died away about half-past seven.

At a meeting of the Hebburn-on-Tyne Urban District Council on Monday last week, the General Purposes Committee reported that the Clerk had again written to the Northern Counties Electricity Supply Company, Limited, in regard to the condition of the cables in the district and the further fusings that had taken place, and had received a reply setting out the advantages that would be derived from the change-over to the alternating current system, and stating that when this had been made the supply in the district would be much improved, and that the unfortunate occurrences complained of would cease. A letter had also been received from the Board of Trade to the effect that they proposed to hold a general inquiry as soon as possible in regard to the particular method of laying cables in Hebburn and certain other districts, and that experiments were being made on samples of bitumen used in these districts. The Council decided to employ an expert to inspect the mains, and to report to the Council, and, if necessary, to attend the inquiry in London.

Vertical Retorts for Nelson.—The Gas Committee of the Nelson Corporation have considered a report of the Gas Engineer (Mr. A. Morton Fyffe) on the subject of enlarging the producing capacity of the carbonizing plant, which is necessitated by the rapidly increasing consumption of gas. The Committee have agreed as to the advisability of the extension, and of the installation at the Brierfield works of vertical retorts having a capacity of 1½ million cubic feet per day.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

About 25 members of the Scottish Junior Gas Association (Eastern District) were present at the opening meeting in Edinburgh, at which Mr. Bishop, the retiring President, introduced Mr. Chalmer (Vice-President) to take the chair in place of Mr. William Geddes, who is President for this year, but unfortunately was unable to be present through illness. After the usual medal had been presented, Mr. Geddes's presidential address was read. This is a most well-designed and well-put paper, and a sample of the very excellent work which is being done in these Junior Associations. Each point of it has been carefully thought out; and the remarks regarding the value of coal not being judged alone by its gas-making power may very well be taken to heart by many gas managers. Mr. Geddes is accustomed to statistical work, and he understands the value of figures in judging a point. After the reading of the address, of which there was no criticism, Mr. Fox (of Messrs. James Milne and Son, Ltd.) read a short paper on the "Safety Meter," illustrating his remarks by a meter of the type referred to, attached to a bracket carrying two incandescent and two flat-flame burners, and also a pressure-gauge. Before commencing the reading of the paper, Mr. Fox lighted the burners and set the lever to "night." By the time he had finished reading, the quantity allowed for the night supply had been consumed. He then left one of the cocks open, and showed the action of a governor attached to the outlet of the meter, which prevented the gas being turned on while any of the cocks were open. The value of the arrangement lay in the fact that a nervous consumer, who feared the possibility of gas escaping during the night, could set this meter to supply a quantity of gas sufficient for use in emergency during the night, but not enough to cause any serious effects in the event of leakage. Mr. Fox showed a few diagrams of the governor in section. At the close of the paper the principal points raised were, first, the initial cost of the meter and, secondly, the action of the meter where pneumatic lighting was in use. Mr. Fox said the cost would be about the same as a "slot," and for such an improvement a small rental might be charged. Arrangements can be made for sufficient supply to be kept up to serve the bye-passes in all the burners that are lighted during the night. Unfortunately, the supply of gas at the Heriot-Watt College was hardly sufficient for Mr. Fox's purpose, but it served to indicate the advantages of the invention.

Dundee is not to have its tar-distillation depôt without some opposition. At a special meeting of the Town Council, letters were read from owners of property in the neighbourhood of the proposed site, objecting to the scheme as likely to injure their property on account of odours arising from the process emanating from the works. Bailie Paton objected strongly to the whole scheme. He said while they were told the profit would be about £1500, the actual amount would be only £100; the difference being made up by the saving in railway

with Design

You must have attractiveness in Modelling and Design. And we claim, in addition to having a radiant efficiency of nearly 60 per cent. in our "Period" Series, that our Gasfires comprise the finest and handsomest range of designs on sale to-day. For other beautiful designs see specially engraved brochure.

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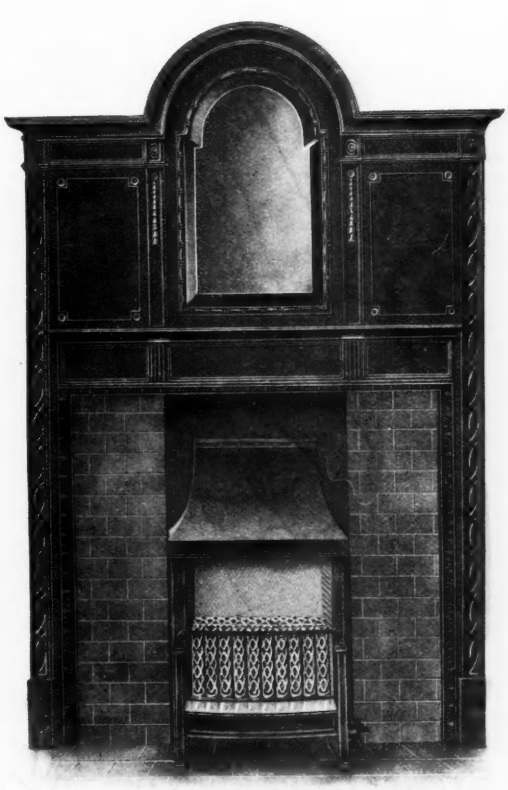
WORKS: WARRINGTON.



The "Chippendale as built-in Gas Grate.

carriage, and that little or no labour would be required for the working-up of these residuals. Mr. R. M. Noble, the Convener of the Gas Committee, and Mr. Alexander Yuill were both strong on the fact that no smells would come from the works. Mr. Noble objected to the statement that the members of Council had not been sufficiently informed. The scheme was of great importance to Dundee, as the prices hitherto obtained from these residuals had been kept down by trade "rings." An allegation was made that members of the Council had been canvassed by firms in the trade to try and prevent the Corporation undertaking this profitable business. The Lord Provost remarked that no argument had been adduced which would cause the Council to go back upon their former decision. This was the opinion of the majority, as by 18 votes to 5 the scheme was approved.

The decision of the Gas Committee of Hamilton to visit the Gas Exhibition as a body is to be commended, although it is perhaps unusual, but that the whole Committee, or for that matter the whole Town Council, would obtain much enlightenment from visiting the various works where vertical retorts are in use is very doubtful. Expert engineers are not agreed upon the best system. It is hardly to be expected, therefore, that gentlemen who are no doubt excellent business men in their own line can pick out the points of the different systems and judge for themselves as to their suitability for the works which they control. Surely, as was voiced by Councillor Keith, a report from a single expert, who could first look into the requirements of the burgh, and then judge the plant most suitable for the works, would be likely to ensure the provision of the best apparatus. Councillors, unlike directors of companies, seem to think they are themselves experts as soon as they are placed on a committee, and therefore can judge for themselves on subjects which the director, whose pocket is perhaps more directly concerned, would leave to the expert to decide. The system is likely to cause mistakes and expenditure of money unnecessarily, and thus delay the reduction in the price of gas which it is the first duty of all councillors to hasten.

The Lanark gas transfer has been completed by the authorization of the payment of £16,307 19s 8d. by the Gas-Works Committee. Of this sum, £16,000 represents the purchase price; the balance being for interest and urchasers' and sellers' age uts' expenses.

The 10,000 additional shares offered by the Bothwell and Uddingston Gas Company have been fully taken up, according to a report, after the meeting of the Directors, when the tenders were opened.

At the meeting of the Denny Town Council, the Gas Manager reported that, when the old retorts had been removed from the oven, the arch and back wall were found to be badly bulged, and repairs to them had to be made at once. This having been done without consultation with the Council, Bailie Lochhead, the Convener, stated that he had assured himself that the work was really immediately necessary, and that it had now been almost completed.

The underpinning of the retort-bench at Falkirk is causing some remark at the ward meetings in that burgh; some people considering it as a most remarkable engineering feat, and others satirically stating that "the building of the Forth Bridge is nothing to what has been done at the gas-works." Thank goodness all councillors are not like those referred to above, as one of the Falkirk Town Council has owned that he was "not a manufacturer of gas," although he had been addressing a meeting for a considerable period of time. Some people are asking locally if the increase in price of gas carries with it a corresponding increase in illuminating power. When will people understand that increase of illuminating power is of no consequence in these days, and that what is wanted is increase in calorific value?

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 18.

Sulphate of Ammonia.

Throughout the week there has continued to be a paucity of fresh business from direct buyers, and the requirements for covering previous sales have not been sufficient to arrest the decline in prices. Consequently the market has still a drooping tendency, and the nearest values at the close are £13 1s. 3d. per ton f.o b. Hull, £13 2s. 6d. per ton f.o.b. Liverpool, and £13 5s. per ton f.o.b. Leith. For future delivery manufacturers maintain a firm attitude, and no first-hand transactions have transpired. Dealers are, however, reported to be taking orders at about prompt prices for delivery up to the end of the year, and at a premium of 5s. per ton for the first half of 1914.

Nitrate of Soda

The market for this article is somewhat easier, and spot quotations have been reduced to 10s. 7½d. per cwt. for ordinary and 11s. for refined quality.

LONDON, *Oct.* 20.

Tar Products.

Business on the whole in tar products is still somewhat quiet. Although manufacturers are unwilling to accept lower prices for pitch, the market appears to be slightly weaker, and some business has been done at figures lower than those quoted by the manufacturers. There are very few buyers in the market at the present moment; and even these will not pay anything like the majority of quotations made from this side. Benzols are firm, and a fair amount of business has been transacted. Solvent and heavy naphthas are quiet, and business is difficult to arrange in either of these products. Crude carbolic is decidedly weak, and business is reported at slightly lower prices. Creosote remains firm, and a fair amount of business has been done during the past week at the equivalent of to-day's quotations.

The average values during the week were: Tar, 29s. to 33s.; Pitch, London, 43s. 6d. to 44s. 6d.; east coast, 43s. 6d. to 44s.; west coast, Manchester, 42s. 6d. to 43s.; Liverpool, 43s. 6d. to 44s.;

Clyde, 44s. 6d. to 45s. Benzol, 90 per cent., naked, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 1s.; North, 11d. Toluol, naked, London, 10½d. to 11d.; North, 10½d. to 11d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 10½d. to 10⅝d.; North, 9⅝d. to 9¾d. f.o.b. Heavy naphtha, naked, London, 10d. to 10½d. f.o.b.; North, 9d. to 9½d. f.o.b. Creosote, in bulk, London, 3⅜d. to 3½d.; North, 3d. to 3⅛d. Heavy oils, in bulk, London, 3⅝d. to 3¾d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 1d. to 1s. 1½d. Naphthalene, £4 10s. to £10; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit; "B" quality, nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been very little strength in the market during the past week. Considerable selling has been going on at lower prices; and on the whole, we have seen a drop of a further 2s. 6d. per ton. In London the value is not more than £12 7s 6d.; Hull, £13 1s. 3d. to £13 2s. 6d.; Leith, £13 3s. 9d. to £13 5s.; Liverpool, £13 2s. 6d. to £13 3s. 9d.; Middlesbrough, £13 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a good demand for coal in the north-eastern market, and for prompt loading the prices are firm; while for forward delivery there is a little ease. In the steam coal trade, best Northumbrians are from 14s. 9d. to 15s. per ton f.o.b.,; and second-class steams are about 13s. 3d. per ton. For steam smalls, the prices vary a good deal - from 6s. 9d to perhaps 9s. 3d. per ton f.o.b.; but these kinds of coal appear to be more abundant, and are thus a little weaker. In the gas coal trade, there is now a strong demand for prompt and early delivery, for which for best Durhams 15s. 6d. per ton f.o.b. is now the current price. For delivery to the end of the year, 15s. per ton is quoted. Second-class gas coals are in good demand at 14s. to 14s. 3d. per ton f.o.b.; and for "Wear specials" about 15s. 9d. is asked. There are negotiations in progress for gas coals for some of the ports of the Mediterranean for next year; and, as far as can be judged, the probable price is somewhere near 13s. 6d. per ton f.o.b. for best Durhams. The present scarcity of gas coals, however, and the large contracts now in course of running, rather limit business. Coke is steady. Gas coke is more plentiful; and for good makes the price is from 17s. 3d. to 17s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The coal trade throughout Scotland continues in a very satisfactory position, despite the fact that waggons and tonnage are on the short side. On the Glasgow Coal Exchange on Friday, the following were the approximate prices quoted: Ell coal, best brands, 13s.; splint, 13s. to 15s.; Navigations, 15s. to 17s.; steams, 13s. to 14s. 6d.; Hartleys, 15s.; trebles, 13s. 9d.; doubles, 12s. 3d. to 12s. 6d.; singles, 11s. to 11s. 6d.; pearls, 9s. 3d. to 9s. 6d; dross, 8s.—f.o.b. Glasgow.

Extensions at the Romsey (Hants) Gas-Works.

The Romsey Gas Company on Monday of last week inaugurated a new telescopic gasholder and station meter. The Chairman of Directors (Mr. J. Baker) turned on the gas from the new holder into the town mains; and at a subsequent gathering, expressing the great satisfaction the Board felt at the excellent way the work had been carried out by their Manager, Mr. F. J. Falkner, he eulogized the constant and painstaking interest that he took on the Company's behalf, which was so amply reflected in the continued success of the Company. Additional land had been purchased; and, as well as the apparatus referred to, a new and picturesque residence for the Manager was nearing completion. The Chairman said the thanks of the Board were due to the Contractors (Messrs. Willey and Co., of Exeter) for the first-class way in wh ch the whole work had been carried out. It was to their entire satisfaction. The holder, of neat and substantial design, is 60 feet in diameter, in two lifts. Erected in a steel tank. with lattice standards and girders, it forms quite a landmark in the district. The station meter, to pass 8000 cubic feet per hour, has been erected in a compact house adjoining the holder.

Alleged Nuisance from the Conway Gas-Works.—A case was before Mr. Justice Joyce, sitting in the Chancery Division of the High Court of Justice, last week (and adjourned until to-day), in which Mr. Albert Wood claimed damages from the Corporation of Conway, and an injunction, in respect of an alleged nuisance caused by them in the manufacture of gas. A report of the hearing, so far as it has proceeded, is in type; but unfortunately it has been kept out of this issue by the press of other matter.

Sleaford Water Supply.—A public inquiry was held at Heckington, near Sleaford (Lincs.), on Wednesday last, by Mr. R. H. Bicknell, M.Inst.C.E., in regard to an application made to the Local Government Board by the Sleaford Rural District Council for power to borrow £2700 to convey water for domestic purposes by 3-inch steel tubes several miles down the Fens. There was a large attendance of ratepayers, many of whom opposed the scheme, and urged that the Council had not consulted them. Mr. C. E. Clements, on behalf of the Council, explained that the inhabitants number 1664; the assessable value is £4828; and the outstanding loans are £1358. Mr. Horn, Chairman of the Parish Council, said £100 per annum could be saved by using 2-inch steel pipes. The Inspector very strongly advised the Council to keep to the 3-inch pipes; and he advised the people who had complaints to lay them before the Parish Council. If they did not obtain redress, they could then appeal to the Local Government Board, who would see that justice was done.

Over 25 years'

manufacturing experience
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WELSBACH

BRITISH MADE

GAS MANTLES

That is *one* of the reasons why they are unequalled for STRENGTH and BRILLIANCY.

UPRIGHT (C, CX & PLAISSETTY)
AND
INVERTED.

AN INVITATION:

Visitors to London for the National Gas Exhibition should also endeavour to pay a visit to the Welsbach Showrooms at King's Cross, W.C., where all the latest and best Gas Appliances are to be seen.
Motor 'buses run every few minutes from the Exhibition entrance to King's Cross—the service is No. 44.

THE
WELSBACH LIGHT CO., LTD.
WELSBACH HOUSE,
KING'S CROSS,
LONDON, W.C.
And at BIRMINGHAM, MANCHESTER, LEEDS, HANLEY, HULL, BRISTOL, & DUBLIN.

Finances of the British Coalite Company, Limited.

We learn from the "Financial Times" that a circular has been issued by the British Coalite Company, Limited, announcing that the experimental work which has been in progress for several years has at length yielded satisfactory results, and a contract has been entered into for the erection by certain colliery interests of an additional plant capable of carbonizing 200 tons of coal per day of 24 hours. In order to provide the funds necessary to carry out this scheme, the capital account is to be reorganized, and in this connection it is proposed to create a 6 per cent. second mortgage for £75,000, while the ordinary capital will be written-down from £721,082 to £103,858. The deferred ordinary capital will be reduced from £500,000 to £183,108. After 10 per cent. has been paid on the ordinary shares, the deferred shareholders are to receive 8 per cent.; any surplus then remaining to be divided *pari passu* between the two classes of capital. The first mortgage debenture debt of £60,000 will be left unchanged. Our financial contemporary says: "The terms of the scheme have already aroused a certain amount of criticism, and it seems possible that the Directors will have to modify their proposals in some respects."

Price of Gas for Power at Walsall.—The Walsall Gas Committee have decided that the price of gas used within the borough for power and manufacturing purposes shall be reduced during the current quarter as follows: Under 100,000 cubic feet, 1s. 7d. per 1000 feet; 100,000 to 200,000 feet, 1s. 6d.; 200,000 to 500,000 feet, 1s. 5d.; 500,000 feet and upwards, 1s. 4d. These prices are subject to a discount of 2½ per cent. for payment within a month of demand. Gas used for motive power and manufacturing purposes must be registered through separate meters.

Gas for Retail Trade Purposes in Bradford.—At a quarterly meeting of the Bradford Chamber of Trade last week, the Bakers' and Confectioners' Section introduced a demand that the Corporation Gas Department should supply them with gas for trade purposes—viz., for heating their bakery gas-ovens—on similarly advantageous terms to those already granted to engineers for their gas-engines. The meeting generally agreed with this demand; but the delegate of the House Furnishers' Section said surely the gas they used was also for trade purposes, and they should be included in the recommendation. The Chairman of the Drapers' Section remarked that the gas employed for their shop lighting was also for trade purposes. The hairdressers' representative claimed that the gas for boiling their shaving water was also used for trade purposes; and the delegate of the tailors said he thought they might claim the same privilege in respect of the gas consumed by them for heating irons. A member said the original demand was in respect of baker' ovens, which might be looked upon as a very reasonable request; but the Chamber must be careful not to make itself ridiculous. It was eventually decided to recommend the Parliamentary Committee to give consideration to the suggestions made.

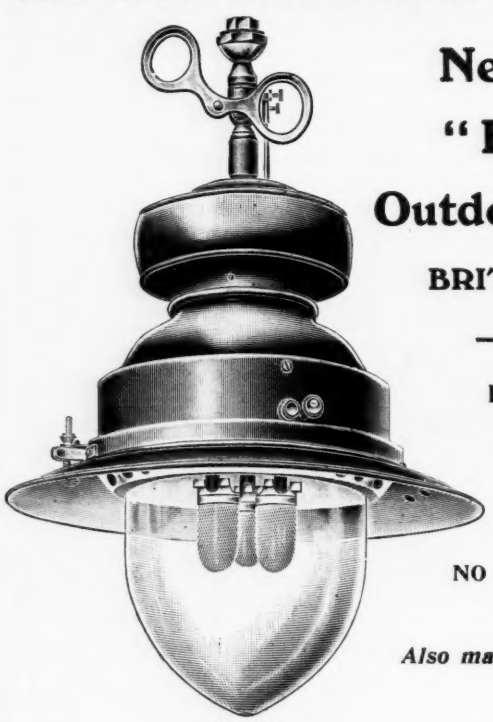
Liverpool Water Committee's Work.—At the final meeting of the Liverpool Water Committee for the current municipal year, the Chairman (Colonel R. S. Porter) was heartily thanked for his services. In reply, he said it was satisfactory that the large increase in consumption had been met without any increased expenditure for leading mains; but there could be no doubt that some important extensions and enlargements of the distributing system were urgently called for. The total quantity of water supplied during the last twelve months, to all places from all sources, had been 13,442 million gallons, or just about the capacity of Lake Vyrnwy. He had been visiting some of the large water-works of the country, and in no case did he find that provision had been made in the way of storage against periods of drought to anything like the same extent as by Liverpool. He had no anxiety as to the sufficiency of the resources and the magnitude of the reserves.

APPLICATIONS FOR LETTERS PATENT.

22,447.—SOUTHGATE, H. B., and HILLARY, G., "Jointing pipes." Oct. 6.
22,485.—ROBIN, J. I., "Mantles." Oct. 6.
22,487.—SUTHERLAND, J. G., and A. G. SUTHERLAND, LTD., "Prepayment meters." Oct. 6.
22,547.—ROYSTON, E. R., "Cocks or valves." A communication from J. O. Nichol. Oct. 7.
22,585.—REHMANN, H., and BANGERT, H., "Regenerative furnaces." Oct. 7.
22,618.—DEGENHARDT, W. R., "Generating gas." Oct. 7.
22,632.—ALSTON, C H. T., and HOUSTON, P. T., "Power-gas installations." Oct. 7.
22,633.—ALSTON, C. H. T., and HOUSTON, P. T., "Gas-washers." Oct. 7.
22,646.—KLUGE, E., "Separating specifically heavier admixtures from gases." Oct. 7.
22,690.—KENT-JOHNSTON, A. G., "Lighting and extinguishing lamps." Oct. 8.
22,712.—M'COURT, C. D., and BONECOURT SURFACE COMBUSTION, LTD, "Bolt and rivet heating furnaces." Oct. 8.
22,784.—WILSON, C. S., "Valves for high-pressure gas." Oct. 9.
22,807.—LYNDE, F. C., "Air-gas machines." Oct. 9.

At the fifth annual general meeting of the Bland Light Syndicate, Limited, on Tuesday last, the Managing-Director (Mr. F. J. Gould) reported that the business was in a very sound condition. The report and accounts were adopted, and a dividend of 12½ per cent. for the year ended April 30 was declared. Mr. Thomas Glover (of Messrs. Glover and Main, Limited) was elected to a seat on the Board. The shareholders present expressed their satisfaction both as regards the management and the condition of the business; and the meeting concluded with a vote of thanks to the Chairman.

THE BLAND LIGHT SYNDICATE, LTD., 63, QUEEN VICTORIA ST., LONDON, E.C. (4 Doors from the Mansion House Station). 2, CARR ST., Blackfriars & Deansgate, MANCHESTER.



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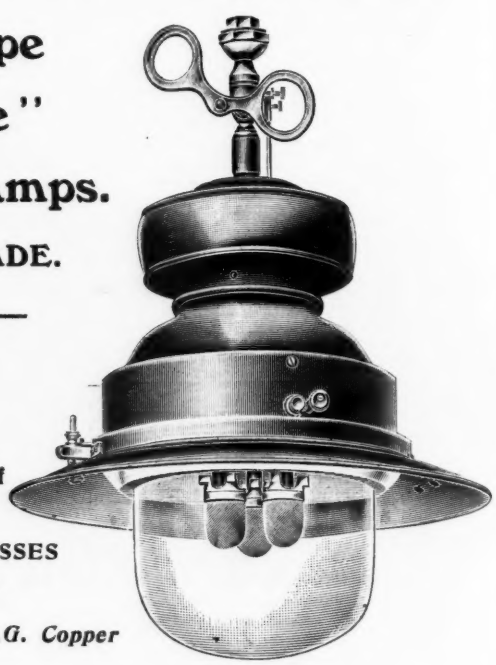
BRITISH MADE.

Rainproof
Shadowless
Windproof

NO INNER GLASSES REQUIRED.

Also made in 20 S.W.G. Copper



No. 15.
High Power Low Pressure "Blanlite" Lamp,
600 c.p.
Price, 3-lt. Enamelled Steel, complete,
70s.

No. 15.
"Blanlite" Outdoor Lamp,
375 c.p.
Price, 3-lt., complete, Enamelled Steel,
60s.

The streets of Earls Colne, in Essex, are to be lighted by gas. The cost will be met by a rate of 4d. in the pound.

The well-known Patent Agents Messrs. Haseltine, Lake, and Co. have recently removed their London offices to 28, Southampton Buildings, Chancery Lane, W.C.

The annual abstract of accounts of the Bradford Corporation, just issued by the City Treasurer, shows that the income from the Gas Department in the past financial year was £337,541, that the working expenses were £258,587, and that the gross profit was £78,954; the surplus for the year being £19,745.

The writer of "Told after Shop Hours" in last Saturday's "Ironmonger," referring to the "ding-dong race for supremacy between the purveyors of gas and the suppliers of electric current," said: "The most notable triumph that the advocates of gas have achieved lately has been the closing-down of Electra House at Rushey Green, Catford, as a demonstration dwelling, equipped throughout with fittings for showing the capabilities of electricity for heating and cooking as well as lighting; while the house next door, fitted up for displaying the resources of gas in the household, goes victorious on its way. To complete the discomfiture of the electrical people in this instance, the new tenant of Electra House is having the place re-piped for gas, so convinced is he of the superiority of the older illuminant."

Messrs. D. Harper and Co., of No. 258, Holloway Road, N., who are in business as advertising novelty manufacturers, have a number of attractive goods in their exhibit at Shepherd's Bush. Among them are the little calendars, of a size to slip easily into the purse or vest pocket, which they have supplied to, among others, a number of the leading gas companies. The Company have, in fact, a working exhibit, and show the operation of blocking the covers for these calendars, which they are supplying to the Gaslight and Coke Company for 1914. A neat little calendar is one of the things that are likely to be kept and referred to by those into whose hands it may fall; and therefore it must possess a decided value as an advertising medium. In these particular calendars the gold-blocked advertisement on the cover is, no doubt, the main feature from the point of view of the undertaking distributing them; but it is intended to add several pages of useful information about gas. The Harper purse and pocket calendar should prove to be one of those stones that is capable of killing two birds—advertising the existence and purpose of a gas company, and providing a welcome and useful article for persons on whom the company's announcement may not be lost. At the worst, a pretty little gilt-edged calendar, with one page to a month, and room opposite for memos, is hardly likely to be consigned to the "W.P.B." until the period to which it relates has expired.

GAS COMPANIES' STOCKS AND SHARES.

WHAT is to be said of the state of things on the Stock Exchange last week? Perhaps the best that can be said is that it was not quite so bad as the week before. Markets did not present one uniform unbroken series of falls; and here and there a spot might be found which, if not exactly bright, was not absolutely gloomy. The familiar depressing factors were still in operation—viz., industrial unrest, foreign forced sales of sound securities, apprehension of even dearer money, &c. However, the settlement of the fortnightly account with only one small catastrophe was relieving. The opening on Monday was deadly torpid—preparations for the settlement almost engrossing attention. Movements were few and slight, and generally downward. Government issues showed little change, and Consols none. Home Rails were just alive enough to show their weakness. Transatlantics were depressed by Continental sales; and Foreign were inanimate. Tuesday was very quiet, with no life in anything. At first there was some disposition to look on the bright side of things; but it broke down under foreign pressure. Gilt-edged were steady; but Rails were dull, and Transatlantics quite weak. Wednesday was idle, except over settlement matters, and a dull tendency shook prices down; but, some Continental support coming in, a partial recovery was effected. Consols were firm, Rails moved slightly and irregularly, and Transatlantics amended. Thursday began with a better air of cheerfulness; and two or three of the leading departments were certainly firmer. But later things clouded over considerably, and prices fell back. Government issues escaped lightly, but others were hard hit. Friday was a dull day for most; but, again, Consols were an exception. The usual realization and foreign pressure to sell were too strong for the rest. Rails gave way after a gallant stand, and Transatlantics were quite flat. On Saturday the positions were reversed, several departments looking better; while Consols receded $\frac{1}{8}$, closing at $72\frac{1}{2}$ to $72\frac{3}{4}$—the same as the week before. In the Money Market there was a fair demand, which the supply was ample to meet. Discount quotations continued to harden; and there was much speculation as to whether the 5 per cent. Bank rate will not have to go a little higher. Business in the Gas Market showed a falling off in volume; and several issues that are ordinarily before the public gaze were altogether neglected. The tendency was not good; several quotations showing a slight fall. But it was not to be expected that the market should be wholly exempt from the far-reaching influences which exercised a very depressing influence on the rest. In Gaslight and Coke issues, the ordinary was less active; and the range of marked prices was from $100\frac{3}{4}$ to $101\frac{1}{4}$—a fall of $\frac{1}{4}$. In the secured issues, the maximum changed hands at $74\frac{1}{2}$ to $75\frac{1}{2}$, the preference at $93\frac{1}{2}$ to $94\frac{1}{2}$, and the debenture at $72\frac{1}{4}$ to $73\frac{3}{4}$—a fall of $\frac{1}{2}$. South Metropolitan was little dealt in, and realized from $108\frac{1}{4}$ to $109\frac{1}{2}$ (a fall of $\frac{1}{2}$); while the debenture fetched 73 to $74\frac{1}{4}$. In Commercials, the 4 per cent. was done at $105\frac{1}{2}$ and $106\frac{1}{4}$. Among the Suburban and Provincial group, British was rather active at $44\frac{1}{2}$ to 45, South Suburban changed hands at $116\frac{1}{2}$, Wandsworth "B" at 131 and 132 (a fall of 2), and (on the local Exchange), Liverpool debenture at 97. In the Continental companies, Imperial marked 165 to 167, Union 80, ditto preference $125\frac{1}{2}$, and Malta $4\frac{7}{8}$. Among the undertakings of the remoter world, Monte Video made $12\frac{5}{16}$, Oriental 125 to 126, Primitiva $5\frac{3}{16}$ to $6\frac{5}{16}$, ditto preference $4\frac{7}{8}$ to $5\frac{1}{16}$, and River Plate $89\frac{1}{2}$ and 90.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

LADY DEMONSTRATOR. Birkenhead Gas Undertaking. Applications by Oct. 31.
ASSISTANT TO ENGINEER. No. 5798. Applications by Oct. 31.
RENTAL CLERK. Maidstone Gas Company. Applications by Nov. 4.
WORKING MANAGER. Market Drayton Gas Company. Applications by Oct. 29.
ANALYTICAL CHEMIST. Cardiff Gaslight Company. Applications by Oct. 29.
SUPERINTENDENT WATER-WORKS DEPARTMENT. Calcutta Corporation. Applications by Dec. 8.
FOREMAN. No. 5799.
JUNIOR CLERK. Box 015, c/o Clark's, Great Portland Street, W.

Appointments, &c., Wanted.

MANAGER, ASSISTANT MANAGER, OR TRAVELLER. No. 5800.

Agency Wanted.

COAL AND PIPES. No. 5797.

Manufacturer Wanted.

PATENTEE. 10, Cranley Place, S.W.

Plant, &c. (Second Hand), Wanted.

GASHOLDER. Imperial College of Science and Technology, South Kensington.

Plant, &c. (Second Hand), for Sale.

RETORTS AND MOUTHPIECES. Newcastle-on-Tyne Gas Company.
STAND PIPES, IRON, VALVES, HYDRAULIC MAINS, LEAD, BRASS, METERS, &c., &c. Wrexham Gas Company.

Patent Licence, &c.

GAS METERS. Barker and Brettell, 77, Colmore Row, Birmingham.

Stocks and Shares, Sales of.

BRENTWOOD GAS COMPANY. London Mart. Nov. 4.
CHESTER WATER COMPANY. By Tender. Nov. 15.
COLONIAL GAS ASSOCIATION. London Mart. Oct. 28.
CREDITON GAS COMPANY. London Mart. Oct. 28.
LEA BRIDGE GAS COMPANY. London Mart. Oct. 28.
LITTLEHAMPTON GAS COMPANY. 25, High Street, Littlehampton. Nov. 5.
REDDITCH GAS COMPANY. Grand Hotel, Birmingham. Oct 30.
ROMFORD GAS AND COKE COMPANY. London Mart. Nov. 4.
SAXMUNDHAM GAS COMPANY, LIMITED. London Mart. Oct. 28.
SOUTHGATE AND DISTRICT GAS COMPANY. London Mart. Nov. 4.
TITCHFIELD GAS COMPANY. London Mart. Nov. 4.
UNITED DISTRICT GAS COMPANY. London Mart. Oct. 28.
UXBRIDGE GAS COMPANY. London Mart. Oct. 28.
WEST SURREY WATER COMPANY. London Mart. Nov. 4.

TENDERS FOR

Coke.

BRENTWOOD GAS COMPANY. Tenders by Oct. 29.

Fire Clay Goods.

SHEFFIELD GAS COMPANY. Tenders by Nov. 4.
LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by Nov. 8.

Meters.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by Nov. 8.

Purifier Boxes.

SHEFFIELD GAS COMPANY. Tenders by Nov. 4.

Sulphuric Acid.

LEICESTER GAS DEPARTMENT. Tenders by Nov. 1.

Tar.

BRENTWOOD GAS COMPANY. Tenders by Oct. 29.

NOTICES TO CORRESPONDENTS, ADVERTISERS AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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See Illustrated Advertisement, Oct. 14, p. 186.

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C. C. CHATTERJEE,
Secretary to the Corporation.
Municipal Office, Calcutta,
Sept. 25, 1913.